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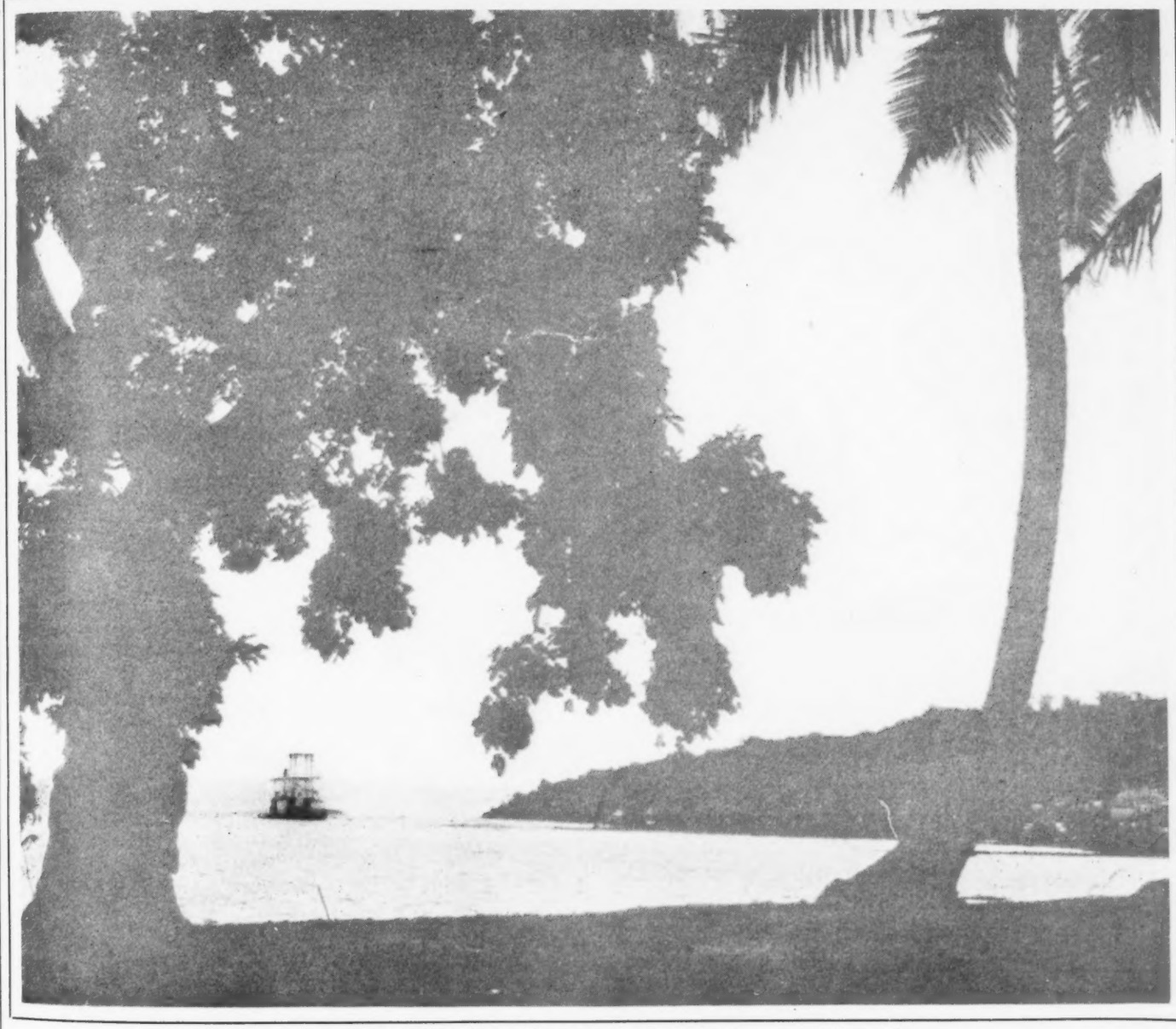

Dredging for gold in the Philippines, along the coast of Ambos Camarines, Island of Luzon

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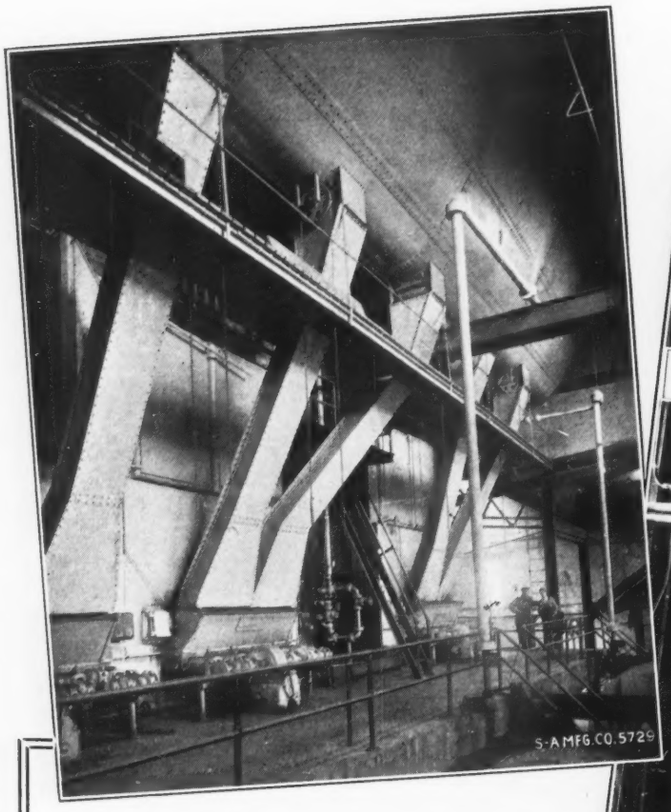
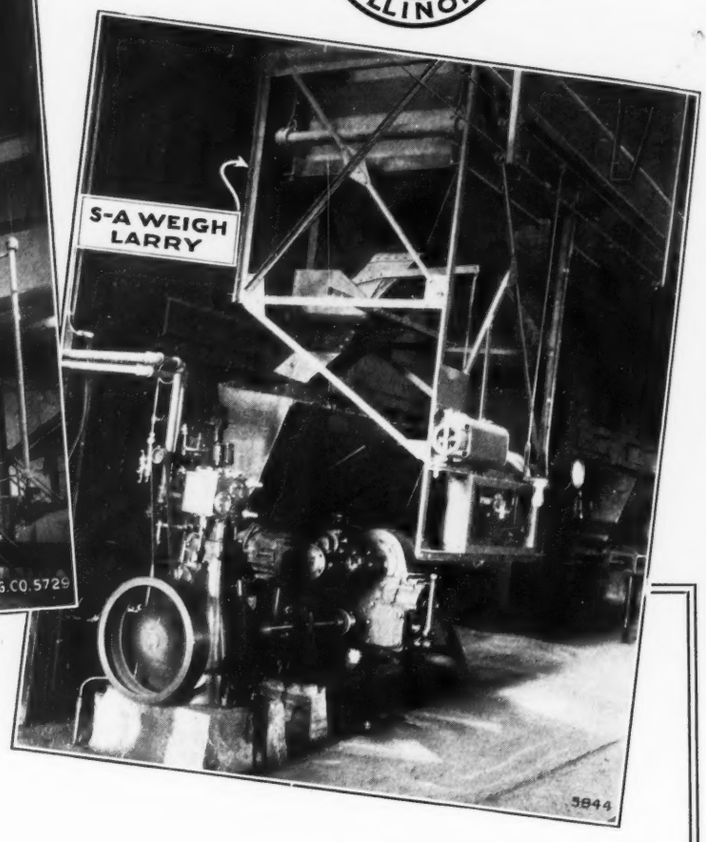
Biography of John C. Greenway





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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 119 | New York, May 2, 1925 | *Number* 18

Engineers and Legislators

THE ENGINEERS of St. Louis have set a precedent which is worth chronicling. On Dec. 29 of last year the engineers invited to a dinner the members-elect of the coming legislature, with the promise that none of the legislators would be asked to speak, nor would any request or propaganda for support of any bills be introduced. The meeting was a great success; and thereafter, if any of the engineers had occasion to go to the legislature, they met friends instead of strangers. A still more interesting result was that when the measure proposing to license engineers came up, a few letters from engineers in St. Louis to members of the legislature with whom they had become acquainted at this dinner resulted in a recommendation from the committee to which the bill was referred, that it should not pass. A second measure to license engineers received even less attention.

The second experiment along this line was a dinner given on April 18 by the engineers to the Board of Aldermen, with whom the engineers had already established friendly working relations. There were twenty-three alderman guests and thirty-five engineer hosts. The menu card bore on the front the recommendation to the engineers: "Get Acquainted With Your Alderman. You May Like Him." And on the back the suggestion to the aldermen: "Get Acquainted With the Engineer. You May Need Him." Philip N. Moore, mining engineer and geologist, acted as toastmaster. The speeches were all by engineers, and naturally had to do with the engineering problems of St. Louis.

A simple and natural method for engineers to get in touch with the men whose duty it is to legislate on engineering and industrial problems is here exemplified. Too often the engineers meet by themselves and discuss questions of policy and legislation which would be of great interest to the legislator, who never hears of them.

Mexico

WHILE conditions in Mexico are probably better than they have been for many years, they are still far from being as stable and peaceful as they were under the beneficent rule of Porfirio Diaz. Law and order are gaining and are scoring triumphs for progressive government; and eventually the economic disorder and the restlessness brought on by many years of weak government and partial anarchy may bring about a state of affairs which will have all the advantages of Diaz' time, together with at least a partial elimination of the crying evils which eventually brought about the downfall of that régime.

The larger mining and smelting companies have been fairly active in Mexico recently, and some new enterprises of magnitude have been opened up. The full development and utilization of the country's resources, is still, however, in the expectant stage; and the country is not quite as tranquil as would be desirable. Bandits, while probably not more common than in New York, are certainly more abundant than in Texas. Socialism has made headway in one or two states; and in the country at large some legislation disturbing to the wealthy has been enacted, as is well known. At present, a bill is before the House forbidding a landlord to own more than ten houses. But when we consider the handicaps which the population suffered in the time of Diaz through the concentration of all wealth in the hands of a numerically very small class, we may well be tolerant of experiments.

Philosophy of Mining Law Revision

THE PRINCIPLE of democratic government is founded upon an equal representation of divergent and conflicting interests, of rich and poor, employer and employee, of urban and rural population, of East and West. Not only is the form of democracy, whether under republics or constitutional monarchies, founded upon this principle, but this theory is put into practice, and government as a practical matter works out along these lines. In the Senate and House of Representatives, at Washington, for example, representatives of the population of many different sections contend strenuously each for the interest of his particular group. The result of compromise among all these selfish groups tends to work out for the greatest good of the greatest number, and thus fulfills the requirements of democracy. The politician, the statesman, whose care is for the whole, is rare in the halls of representatives: in a certain sense, this broad, detached view is not their job. That is the task of the higher general officers—the President and his Cabinet, and the like.

Among the people of a democracy the same rule and principle exists. Each man strenuously contends to the best of his ability for his rights and for his advantage; while recognizing that his neighbors are doing the same, and that they are entitled to a fair show and a square deal. But the butcher, the tailor, the farmer, the lawyer, the doctor, the minister, are chiefly occupied each in mending his own fences and in safeguarding the material and spiritual phases of his own life and that of his family. The altruistic spirit, the instinct of universal fatherhood and motherhood for the race, are by no means unknown in the rank and file; but they are rare and not counted on. Hence the not infrequent practitioners of altruism are bound to be subject to suspicion—they clearly break the rules, if sincere: but if they are insincere, then they follow the rules, but are not playing fair. Therefore, reformers have a hard time, and are not popular, in their day, with the general run of mankind.

All this general reflection may be applied to the effort which has been made for a number of years to have the mining law revised. At first, the call for the revi-

sion was rather general; but somehow it became eventually more academic, in that its advocacy was left largely with prominent engineers and engineering societies and governmental engineering bureaus. When, after mature deliberation, these elements prepared a bill which was presented in Congress, there arose somehow, in certain mining districts, a movement of suspicion such as is above outlined as natural. The inquiry arose: what are the interests which would profit by the revision of the mining law, and what will they gain by such an action? Immediately in lieu of a satisfactory reply conjecture created an answer. From suspecting interests to suspecting The Interests is an easy step—and are not The Interests one and the same with Wall Street? Better, the miners concluded in many districts, to "bear those ills we have than fly to others that we know not of." The plea of altruism on the part of the engineers promoting the mining law revision, although the true answer, is not and can never be an effective one. The spectacle of a group trying to get such changes for their own benefit would be one more sympathetic and tangible to the common understanding.

The moral is perhaps that except in extreme cases people should not be benefited when they do not want to be benefited. Granted that the United States has poor mining laws, far inferior to those of Canada and Mexico: if the miners of the United States want to hang on to these, along with their abominable system of weights and measures, and the grotesque lack of phonetics in spelling—why should anyone who is not personally interested, or who will not be personally helped by a reform, bother about reforming?

As to phonetic spelling reform, achieved by the French, Italian, Spanish, German, and other nations, we will have none of it, and Theodore Roosevelt ran his head against this stone wall of conservatism. As to the metric system, embraced by France and Germany and most of the rest of Europe, and by Latin America—very recently by Japan and Russia—it will cost too much to change from troy and avoirdupois (and what Interests are trying to make the change?). As to mining law, the mining law of Senator Stewart is good enough for us. Thus we are true to tradition; thus unconsciously we line the United States up with the other great English-speaking group—the British Commonwealth of Nations—and present a solid front as the most conservative, the most pig-headed, the most stable and formidable element of the earth's population. The Anglo-Saxon, the pioneering race, delights in taking these and other hurdles, rather than removing the obstacles from its path, and arriving nevertheless at the van.

Disappearance of Historic Landmarks

THE DISMANTLING of the Goldfield Consolidated mill at Goldfield, Nev., following the fires which sadly changed the face of Goldfield, does not signify that mining is no longer active in this district, for there are several strong prospecting efforts under way, but it does definitely mark the passing of a plant which was a landmark and was of historic interest.

The Combination mine, at Goldfield, was located in May, 1903, and sold later in the year for $75,000, of which $15,000 was in cash. In 1907 it was sold to the Goldfield Consolidated Mines Co. for $4,000,000, after yielding $786,000 in profits to the owners. The Goldfield Consolidated was organized in 1906 by Nixon and Wingfield. During 1906 and 1907, 100 leasing companies were organized, and some made large profits, as the ore was very rich. Ore stealing increased to a remarkable extent. Following the leasing period company operation began. Construction of the Goldfield Consolidated mill was begun in 1908, and the mill was in operation on Dec. 26, 1908. Milling practice at the Combination mill had demonstrated the important details of treatment. F. L. Bosqui was consulting metallurgist; J. B. Fleming prepared plans and specifications, and the Allis-Chalmers Co. supplied the mill machinery.

The treatment plan included crushing in stamp batteries, regrinding in Chilean and tube mills; amalgamation and concentration followed by dewatering and neutralization of the pulp; cyanide treatment in Pachucas followed by filtration in Butters filters and precipitation by zinc dust. A concentrate treatment plant was added later and roasting equipment at a still later date. Recoveries, according to J. W. Hutchinson, who was mill superintendent, and later general manager, were 17.5 by amalgamation, 53.9 by concentration, and 22.6 per cent by cyanidation. At the time there were other reduction plants in Goldfield, the Nevada Goldfield Reduction Co., which operated a 20-stamp, cyanide custom plant, and the Florence and Kinkead mills.

About 1916, flotation was tried out at the Goldfield Consolidated mill, as copper began to appear in the ores. Flotation equipment was installed and operated in 1917. The fortunes of the company began to decline, and in 1918, 40 or more leasers were working in the mines. In 1918, the tonnage treated by the mill was 94,650 tons.

The Goldfield Development Co. was formed in 1919 to take over the properties of the Goldfield Consolidated. Operation of the mill was discontinued in January, 1919, and the remnants of various products were cleaned up. The mill thus operated about ten years. Attempts were made to rehabilitate the mill, but nothing came of them, and the final announcement, recently made, that the plant was to be junked, marks the last of the historic landmarks in the spectacular history of a gold camp of extraordinary interest.

Publication of Land Grant Listings

THE General Land Office has issued an order requiring that on and after March 28, 1925, notice of the listings of land within the limits of various federal grants by states, railroads, and other companies and individuals for the purpose of acquiring title through the government channels must be given publication in a newspaper of general circulation within the county wherein the lands are situated, the newspaper in question to be designated by the register. During the period of publication of such listings or thereafter, before final approval and certification, protests as to any of the tracts will be received by the local officers of the Land Office and will be transmitted to the General Land Office.

Publication of listings of land-patent applications within railroad grants and other lands coming under the provisions of this order is an excellent thing, as it will remove one of the many sources of irritation and difficulty that have arisen over mining claims and other mineral rights acquired upon these lands. It is surprising that such a practice was not long ago established.

The New Price of Iron Ore

IRON-ORE PRICES for the shipping season on the Great Lakes are established every spring and last for a year, though some varying prices are usually incorporated in individual sales made later in the season. They are, therefore, more representative of general trends than are the prices of lead, zinc, or copper ores, which vary from week to week, depending largely on the prices of the respective metals. It is therefore interesting to observe that the iron-ore prices just established for the 1925 season are from 50 to 71c. per ton below those for last year, which, in turn, were even more below those for 1923. Thus is indicated a pronounced downward trend in the price of that distinctly basic commodity, iron ore. To be sure, the contract prices for 1924 were considerably higher than the levels for which a good deal of the ore was sold later in the season, so the reduction is perhaps really not so great as might be thought from the figures quoted.

A month or so ago, an advance in the prices was talked of, and no one, so far as we heard, predicted a decline. But evidently it was felt that the general commodity price level of the coming year was inclined to go down rather than up, and that iron should not adopt a contrary course. No decrease in prosperity is necessarily attendent upon lower prices, either for iron ore or anything else. A proportional lowering of costs is also to be expected, as we gradually work back from the war period of inflation.

International Co-operation Needed

WHEN the British built the large zinc smelter at Avonmouth they duplicated existing facilities and were directly responsible for a waste which runs into huge figures. This example is cited as an indication that any campaign to eliminate waste in the metal trades, to be highly effective, involves international co-operation. There had been great overexpansion in the zinc-smelting capacity of the world before the Avonmouth smelter was started. With this great addition to zinc-smelting facilities, the very great waste, resulting from idle capacity, which was taking place prior to the erection of this plant, now has been increased. Since the British control the raw material necessary to supply this smelter, the probabilities are that some direct profits may be transferred to them, but even that is regarded as doubtful. That nation will share indirectly in the losses which will come to Belgium and the United States because of their idle smelters.

American Mining Machinery

NOT LONG AGO one of the *Mining Journal-Press* editors was discussing with a metallurgical engineer the advisability of publishing an article describing some of the milling machinery being made in Europe, the idea being that perhaps advances in design had been made by foreign manufacturers that would be of interest to American readers. Our friend was of the opinion that such an article was hardly justified, for the reason that the most advanced design and construction are found in the United States. If this is true, there are excellent reasons why it should be so: A rough calculation shows that about 60 per cent of the world's metallic ores are mined and treated in North America, almost exclusively by American machinery. The manufacturers of this machinery are in close touch with operating conditions; they produce in large quantities; and competition is keen. What more natural than that their products should be the best? We say this with all respect to foreign-made mining machinery; the product of several British firms, for instance, has a world-wide reputation for sturdiness and dependability, but these firms are manufacturing in comparatively small quantities for markets thousands of miles away; they lack the close co-operation with the user that obtains in the United States and which is largely responsible for the excellence of the American product.

Are American manufacturers taking advantage of this international market? Is the mine manager in Australia, in India, and in South Africa thoroughly familiar with the American manufacturers' product? In many instances the answer is yes; American mining machinery is in fairly common use throughout the world, but many foreign companies are using inefficient machinery because they do not realize the economies that would result from adoption of up-to-date American types. American mining machinery manufacturers should take note of what their brothers, the automobile makers, are doing. No civilized and inhabited portion of the world is so far removed from Detroit, Mich., as is Western Australia. In that colony in 1924 approximately 11,000 automobiles were registered. The first eight makes, in order of popularity, were as follows:

Ford	3,813	Buick	676
Dodge	1,529	Studebaker	336
Chevrolet	877	Hupmobile	334
Overland	856	Essex	311

Strangely familiar names!

Use of Natural Gas in Stimulating the Flow of Oil Wells

ALTHOUGH the use of compressed air for the securing of further production from oil wells has been practiced for many years, the substitution of natural gas for this purpose is of comparatively recent origin, and its efficiency is now being recognized. Phillip Jones first used natural gas in place of air, in 1914, and took out a patent upon the idea. When the gas pressure in a well falls off, production also falls off. From this point on production under pumping may rapidly decline. The optimum period is during the high gas-pressure stages of the well. Natural gas is applied by pumping it under pressure into the well, which is tubed to a point well below the level of the oil.

At a point about 100 ft. above the bottom of the tubing several holes are drilled, and when the level of the fluid has been depressed to this point the gas enters the tubing and acts as an air lift. The gas which is separated from the oil is compressed and casinghead gasoline recovered. It has been found that the rate of oil delivery is increased over that obtained by straight pumping and the economic result is a considerably increased production.

All oil wells may not profitably respond to the gas-lift, but it appears that this device will occupy a position between production by natural pressure and the final stages of pumping by mechanical means. In addition, the use of natural gas in place of air has the advantage of preventing the corrosion of the pipes which occurs where air is used.

Prominent Mining Engineers

John Campbell Greenway

JOHN C. GREENWAY is one of America's foremost examples of the engineer-soldier—famous at the battle-front whenever his country is at war and equally esteemed manager of two of the country's leading mining companies in times of peace. In either position, the qualities of a born leader of men and an understanding and appreciation of human nature, which Mr. Greenway possesses to the fullest degree, are requisities for success. Born in Huntsville, Ala., on July 6, 1872, he gravitated to the University of Virginia for his early collegiate education. Later he went north, then worked in Minnesota, and latterly in Arizona, so that he has first-hand knowledge of conditions in several sections of the United States and is anything but provincial in his point of view. After studying at Virginia for two years, he went to Phillips Andover and then to Yale, from which he was graduated in 1895. His all-round ability and outstanding personality were in evidence even at this stage of his life, for he was a member of the famous Yale baseball and football teams of the early 90's, and president of his class, '95S. Immediately upon graduation he started at manual labor at the bottom, as a helper at the Duquesne, Pa., furnaces of the Carnegie Steel Co., from which he was promoted to be a foreman. In 1898 the Spanish-American War broke, and his soldier instinct immediately asserted itself; he was a member of Roosevelt's Rough Rider regiment and was cited for gallantry in action. After the war, the then Captain Greenway became assistant superintendent of mines for the United States Steel Corporation at Ishpeming, Mich., a position which he held for seven years and in which he got his first real mining experience. From 1906 to 1910 he was general superintendent of the Oliver Iron Mining Co. on the Mesabi range, in Minnesota, and developed the Great Northern ore properties. He was active for some years in opening up the large bodies of wash ore, for the treatment of which he devised the well-known Greenway turbo log washer, and he built the first mill at Coleraine, Minn. Provison had to be made for the accommodation of large groups of men, and Greenway had charge of the construction of entire towns, highways, and similar civil improvements, in addition to his work as strictly a mining engineer. One of the finest public schools of the state bears his name. Fifteen years ago, in 1910, John C. Greenway went to Arizona as general manager of the Calumet & Arizona Mining Co., a position which he has held continuously since then, with the exception of the time spent in the A.E.F. during the World War. His position with the C. & A. naturally brought him into contact with the work of associated companies, and he is also general manager of the New Cornelia Copper Co., of Tucson; Cornelia & Gila Bend R.R., and vice-president and a director of the Ahumada Lead Co. He superintended the development of the New Cornelia leaching process, with electrolytic precipitation, much of this being pioneer work. He was associated with L. D. Ricketts and H. C. Dudley in the development of the Ahumada and Erupcion lead properties, across the border, which have attracted so much attention in the last two or three years. In fact, Mr. Greenway seems to have had the faculty of associating himself with successful projects, or possibly they are successful because of his association; at any rate, enviable dividend records have been made under his management.

General J. C. Greenway

When the United States entered the World War, Mr. Greenway felt that he could be more useful at the front than in the safer pursuit of helping to supply munitions. Being unmarried, he had not the usual home ties. He was commissioned a major of engineers, but apparently was not altogether satisfied with the fighting possibilities, for he asked to be transferred to the infantry, and served on the Cantigney, Chateau Thierry, St. Mihiel, Argonne, and Meuse fronts. For his brilliant work General Pershing decorated him with the Distinguished Service Cross, and the French Government awarded him the Legion of Honor and the Croix de Guerre, with palms. It is no wonder his promotion to general resulted. After the war, he returned to his former duties in Arizona, his home being at Warren. General Greenway is a member of the A.I.M.E., the Yale Engineering Society, Phi Kappa Psi, and the Book and Snake (Yale) clubs.

Mineral Reconnaissance in the Philippines

Islands Offer Possibilities for Further Development

By Hironao Nishihara
Mining Engineer, Tokio, Japan

THE Philippines are a group of about three thousand islands, scattered in a most interesting manner, like the skeleton of an animal, lying between 5 and 19 deg. north latitude and between 117 and 127 deg. east longitude. Manila, capital city of the Philippines, is 631 miles from Hongkong, 1,306 miles from Nagasaki and 6,221 miles from San Francisco.

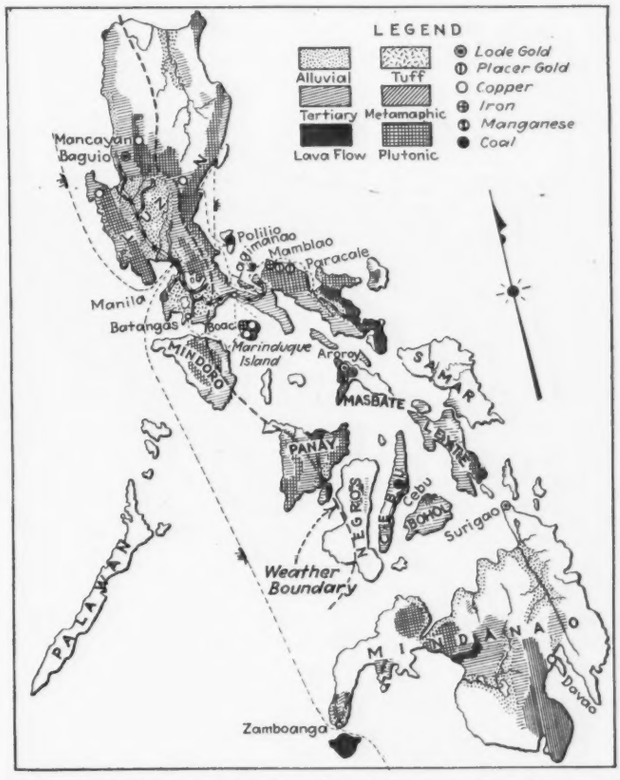
The Philippine Islands resemble the Japanese islands topographically, and the mountains occupy a greater area than the plains. Luzon Island, for example, is divided into three regions—the mountain, the shore range, and the plains. The mountain district of Luzon occupies the central backbone of the island, extending from north to south. The highest known peak in the range is Mount Data, which rises 9,000 ft. above sea. The east flank of this mountain chain is inhabited by head hunters, and much is unknown to the outside world. The rocks that make up these rugged mountains are mostly deeply dissected hornblende granite and diorite. The shore range district occupies a narrow strip of land along the shore and is made up chiefly of Tertiary sedimentary rocks. The general altitude of the range is not more than 500 ft., and the mountain tops are, in contrast to those of higher ranges, smoothly rounded. The plain or lower flat district lies between the mountain district and the shore range, and is mostly of alluvium, where rice, hemp, tobacco, and sugar are raised.

Torrential Rains in Wet Season

The mountain district, being at a higher altitude and more exposed to constant climatic changes so prevalent in this part of the country, is cut deeply with narrow, steep-sided ravines and young streams, most of which have a steep grade of between 4 and 8 per cent. During the rainy season, owing to sudden and heavy precipitation in the higher altitude, the narrow stream channels are constantly scoured by torrential floods that scatter and deposit boulders of immense size. Up to an altitude of about 5,000 ft. tropical vegetation grows in abundance, and to penetrate the wooded country is a task almost impossible without a native guide, who cuts the way through the darkness of the jungle with his knife, called a "bolo."

In the low lands and the jungles the nature of the rocks can be studied only along the streams, in which they are exposed. Above an altitude of about 5,000 ft., tropical vegetation becomes sparse and thickly overhanging ferns and entangling vines give place to straight and stately pine trees. In the mountain district the precipitation is heavy, and during the rainy season water rises in the rivers to 40 ft., or even 60 ft. For this reason any consideration of water reservoir, hydro-electric power-generating plant, concentrating or cyaniding plants, or crosscuts near the stream channels should be discouraged. The steeply graded streams, originating in the mountain district, as they emerge suddenly upon the broad open channels and plains below, surrender their loads far and wide, and boulders measuring a foot across are distributed in the mouth of the valleys over an alluvial fan covering thirty or forty square miles. Gold placers occur in such places, and native panners work at leisure by primitive methods. The presence of large boulders and abundance of water, however, prevent miners from making any attempt to test the ground by boring.

As no reliable geological map has yet been made by the Philippine Government, no definite or satisfactory geological description is possible. A rough sketch map



Map of Philippine Islands, showing general geology and location of mineral deposits

published by the Bureau of Science at Manila is the only guide at present available. According to that and to my observations, the rock that underlies the islands is basic diorite, which forms high mountain ranges. This diorite is intruded or cut through by Pre-Tertiary granite or dikes of allied rocks, such as quartz porphyry. Most of the mineral deposits in the islands containing gold, and sulphides of copper, iron, lead, and zinc are found in these rocks. The Tertiary formation consists of coralline limestone, shale, sandstone, and conglomerate, and is approximately 1,000 ft. thick, lying conformably on top of the basal diorite. Coal and petroleum are found in this formation.

The Post-Tertiary elevation of the islands is indicated by the presence of the coralline limestone at an altitude of between 500 and 1,000 ft. Metamorphic rocks represented by conglomerate, quartzite, slate, and limestone are found, but in a small extent, and although their age is indeterminate, they appear to be older than the diorite.

As the Philippines lie within the tropical zone, summer prevails throughout the year, and although the temperature seldom rises above 100 deg., the heat is felt intensely, owing to the high humidity.

There are two distinct seasons, wet and dry. As indicated on the map, the two zones may be distinguished as the eastern and the western zones by the mountain chain that forms the backbone of the islands from north to south. Heavy precipitation takes place on the east of the range during December, when dry weather prevails on the west of the range. The wet season for the western zone comes in July and August, when the eastern zone is perfectly dry. Rain in the Philippines is always attended by a thunder storm, and its downpour is so thick and fast that the road one stands upon is quickly covered with sheets of water. Typhoons visit the islands regularly in March and September, and every year rivers overflow, villages are inundated, bridges are washed away, and ships are lost in great numbers.

An Experience with Quinine

Typical tropical diseases such as malaria, cholera, and typhus are prevalent in the islands. In Manila, however, the hygienic conditions have been perfected under the strict supervision of the American officials, and not a single case of cholera was reported during my stay of more than five months. In the inland villages the unaccustomed traveler is likely to contract malaria fever, which usually results in an unpleasant condition of health for a long time. Quinine has long been recommended for the treatment as well as for the prevention of malaria. An eccentric Japanese traveler, it is reported, once applied at the Manila Hospital to undergo a general cleaning of his system, although he was in perfect health. He "recovered" after being totally bleached, so to speak, and went into a dangerous pest-infested no-man's jungle in Mindanao. Two months later he came back unaffected with any tropical fever. I am uncertain as to the merit of such treatment against malaria fever, but am inclined to think that it had something to do with its prevention in this particular case.

The population of the islands was reported in 1917 to be about seven million. Americans are mostly in Manila; they are in the government offices or engaged in importation and exportation. A few are in the mining camps or on hemp plantations. Spanish residents in Manila after the Spanish-American War were much reduced in numbers, yet they still maintain a high social standing and their influence over the natives is estimated next to that of Americans. The natives are still non-assimilated groups of tribes represented by, for example, Tagalog, Bisayan, Ilocano, and Pangasinan. They differ from one another in appearance, language, habits, customs, beliefs, and mode of living.

The Filipinos are a lazy and easy-going people. They seem to be contented with the present environment that Mother Nature has provided for them. Are they to be blamed for this? No indeed. God made a country with natural luxury and abundance and has given it to these people to live in. They stretch their slender arms out of bamboo-framed windows to reach a bunch of luscious bananas. Papaya trees laden with fruit rich in pepsin lean over the door as though waiting to be picked as soon as possible. Cocoanut trees cast green shadows over the nipa roof, their nuts bronzed by the red morning sun. The natives should worry not at all. It is Nature that is responsible for the laziness of the innocent people. Their houses are built as simply as can be imagined. The posts are bamboo and the roof is made of nipa leaves. The floor is placed between 4 and 6 ft. above the damp ground, and is covered with split bamboo. A thin piece of matting spread on the bumpy floor makes up a bed. All wastes are thrown or washed down onto the ground through the split bamboo floor, and pigs are always there to feast thereupon. The bathroom is lacking and they usually take themselves to the near-by streams where cows and horses are bathing.

The semi-savage Igorots are more industrious than their superior brothers on the lowlands, and yet they are contented with all that they have today. They would go to sleep rather than labor if they can sustain their lives today, although they may starve tomorrow.

The center of communication is Manila, where the central post office is located, and is connected by a network of wires with the post offices throughout the islands.

For land transportation there is a single-track railroad running north and south from Manila. It is a narrow-gage railroad and was originally constructed by the English. The road is not smooth, and the schedule is not strictly observed. The train runs only between 6 o'clock in the morning and 7 in the evening, and only once a day the limited train runs between Manila and the terminals. There are two classes, the first and the third, and the service is not so good as would be expected. Neither dining- nor sleeping-car service is provided. A sandwich and a cup of coffee can be procured at the midway station at a gold-camp price. Coal is very expensive there, and in its stead mangrove wood is burned. Glowing cinders soft as cotton and as big as a nut occasionally fly into the window. For inter-island voyages about twenty steamers are available.

The highways built by the Americans are 30 ft. wide, well graded and drained, and admirably maintained. Good roads encourage automobile traffic, and in Manila alone more than 5,000 cars are registered.

In traveling in the interior of a semicivilized country like the Philippines the first consideration should be personal safety. My experience in the islands shows that, although considered by some to be extremely dangerous, the interior of the Philippines is one of the safest spots on earth. Occasionally newspapers report savage attacks made on foreigners, but careful investigation would show that even savages in the jungle do not make an attack without reason. I came in contact with semi-savages, and upon several occasions with head hunters in the northern part of Luzon, but never had occasion to consider them dangerous.

There are no lodging places in the interior villages, and one must rely on the generosity and hospitality of the natives. If unpolished rice, carabao's meat, tough as leather; its milk with a "green" taste, bananas, and cocoanuts do not satisfy one's appetite, then sufficient canned goods should be taken along.

In the jungle wild life is sparse. One travels through the woods for many days without seeing any sign of birds or wild beasts, save monkeys. A kind of venomous snake, called "green snake," is regarded the most dangerous, but during a hike extending over several months in the jungle I saw only one. What annoys the traveler the most is perhaps the mountain bloodsucker, which rains, so to speak, upon him from the branches of trees,

or from tall grass. There is no means of protecting oneself, except by wearing high boots, as the feet are easily attacked by these creeping blood suckers. I encountered them in the woods of Pangasinan only.

No matter how clear and clean the water of a spring or mountain stream may appear to be, it must be boiled before being used. Bathing in a stream under the tropical sun is a temptation one must resist, as it generally results in "falling sickness," from which there is no recovery. At a cost of 10 centavos a cocoanut can be purchased at a village, and the juice is refreshing.

Copper Mined in 1855 by Spaniards

Historical records show that the Spanish Government in about 1855 worked a copper mine in the mountain province, North Luzon, and smelted without success. About that time, or a little later, gold placer ground was discovered in the Camarines, but it was worked only on a small scale and by primitive methods. As soon as America came into possession of the islands, American prospectors stormed the country, but owing to the fact that the exposure or outcrop of rock was limited to along the streams or to the mountain province, few new discoveries were made. Since the Bureau of Science has been established in Manila, intensive investigations have been undertaken under the personal direction of able geologists and engineers, and the mineral resources of the islands lately have been more definitely reported.

There are a number of mines in the islands, but only a few are economically workable, as shown on the attached map.

In Luzon there is a productive gold mine owned by the Benguet Consolidated Mining Co. Near Pasig a little iron mine is worked by the natives and iron is cast into ploughs. The gold placers at Mambulao and Paracale are well known. Two gold mines in Masbate Island are energetically worked by the Colorado Mining Co. and the Syndicate Mining Co. Placer ground was located some time ago in the northeastern corner of Mindanao, and was worked for a considerable period. Except the gold mines, the mines in the islands are not as a whole worth mentioning. The owners of the gold mines in the Philippines are Americans without exception, and they all seem to be speeding up their work so as to extract the gold in the shortest possible time.

Coal is imported from Japan, China, and Australia. These imports total nearly 500,000 tons annually. A company was organized in 1917, under the name of the National Coal Mining Co., with a capital of 3,000,000 pesos, to work the coal mines at Polilio Island and Batan Island. The Batan coal mine was once worked under the direct supervision of the government, but it is said to have failed owing to the inferior quality of its product.

The greater part of the Philippine Islands is as yet to be explored. Owing to thick undergrowth and impregnable jungle, satisfactory geological investigation is difficult. There is, however, much more fundamental work to be done. Of late, American engineers are leaving the islands one by one, replaced, but only in number, by the native "know-it-all" young men. The Mining Department has lost its head and field men, and it appears that little will be done for some time. The mining industry of the islands is handicapped by lack of good coal, and as long as freight rates are high there is little hope for its future prosperity.

The Camarines, one of the two richest and the most extensively developed gold placer grounds in the islands, has been worked successfully for many years. It is reached from Manila partly by rail via Hondagua and partly by boat. Six dredges were in operation in 1917. All the placer ground is located either in the sea or along the seashore. The first dredging was done by Australian engineers with dredges of the New Zealand type; later, efficient American dredges were introduced. The average gold content of the wash gravel from seventy-nine boring samples taken on 320 acres was 65 centavos to the cubic yard. The gold is generally fine, and coarse particles are spongy. The gold seems to be irregularly distributed; at some places samples as high as 7 pesos, or about $3.50 to the cubic yard, were taken. The metal is supposed to be derived from quartz veins in the plutonic rocks such as diorite and granite, which are prevalent in the region.

Another placer ground, where a gold dredge may be used to advantage, is in the region of Surigao and several tributaries of Rio de Agusan, in Butuan Sub-Province, Mindanao. Extensive prospecting work was done several years ago, and many times attempts were made to consolidate small contending companies, but the conditions turned from bad to worse, and the whole field was closed down after successive litigations.

The presence of placer gold in the Agno River near Tayug Station, the branch terminal from Paniqui, has been known for many years among the natives, who took up twenty-six claims along the river channel for a distance of 10½ miles. So far no actual working has been done, and neither the number of paystreaks has been proven nor has the gold content been thoroughly investigated. The natives pan the gold out of the terrace gravel between 3 and 6 ft. thick. Efforts to dig test pits have failed on account of inability to control the inflowing water. The river bed is covered with big boulders as much as 2 ft. in diameter, and sampling appears to be difficult.

Gold placers are extensively developed in stream beds, terraces or sea beaches in the islands in localities marked by near-by granite or andesite or quartz-porphyry intrusives.

Keystone Mine Now Idle

The Keystone gold mine is situated a mile south of Port Aroroy on the northwestern shore of Masbate Island. The Keystone Mining Co. was incorporated in 1913, and nearly 210,000 pesos was paid out for the construction of a mill and cyanide plant. Systematic and continuous work was started in October, 1914, and up to the end of September, 1916, a daily average of forty tons of ore had be treated. The mine finally was shut down as the result of insufficient development and the decrease in the grade of the ore. All work was suspended at the time of my visit, and several openings underground were caved.

The deposit is a regular quartz vein, which cuts through diorite in a northwestern direction, with dip of 70 deg. northeast. Hydrothermal alteration of the country rock is noted along the vein walls, where the vein is partly brecciated and contains angular fragments of the country rock. The vein is faulted and fissured and refilled with bluish and grayish chalcedonic quartz. The gold is found in this secondary banded quartz, and in some places specks of free gold are visible. Fine particles of pyrite are disseminated throughout

the vein and the country rock along the vein walls. The total length of the vein is about 500 ft., and its width averages 3 ft. The gold content went as high as $80 to the ton at the surface, and the ore averaged $9 per ton. Within 80 ft. from the surface the ore showed only $4 in gold, and farther sinking became unprofitable.

The Colorado and Syndicate gold mines, two productive mines, are on Masbate Island. C. M. Eye, an able metallurgical engineer, describes them in detail in the *Mining and Scientific Press* of June 27, 1916. The mines are situated close to each other—separated only by a stream. The elevation of the mines is between 400 and 600 ft. above sea level; they are the most conveniently situated mines in the Philippines. The only surface indication of the vein beneath 10 ft. of alluvial is the presence of fragmental white vein quartz in residual red ferruginous clay.

Both the deposits are geologically similar. At the Syndicate mine the country rock is a manganiferous diorite cut by a quartz-calcite vein, which strikes N. 40 deg. W. and dips southwest at an angle of 80 deg. The width of the vein is 3 ft. on an average.

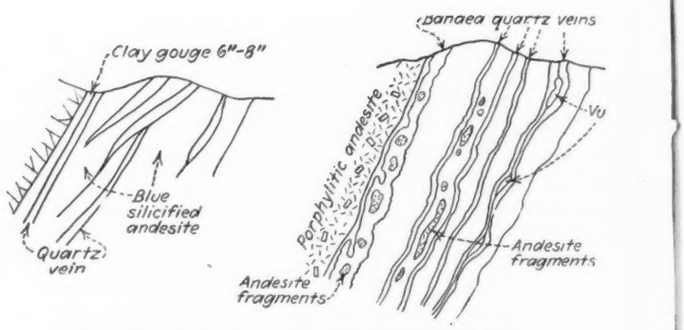
Intense oxidation can be noted in the vein as well as in the country rock, and the walls are hard to distinguish and are also irregular. The gold is fine and invisible and occurs sporadically in the vein. The result of sampling shows, for example, a variation from $2 to $28 within 6 ft. and this irregularity becomes conspicuous with increase in the depth. The ore averages $15 to the ton from the first level down to the fifth, excepting at the third, where the vein is impoverished and averages only $7 per ton.

The Benguet Consolidated

The Benguet Consolidated mine is in the Antamoc Canyon, about 6 miles southeast of Baguio, a summer resort in the Mountain Province. "Baguio" means storm, and, in fact, every year during July, August, and September a "baguio" visits this district with full force and changes the topography of the country. The weather is cool, refreshing, and healthful during the rest of the year. One stormy season the old mill of the company was swept away in the rushing water 30 ft. deep, and was carried 300 ft. downstream. The company owns seven mineral claims.

The important rock that makes up the country is an andesite, which is intensely propylitized in the mineral-

Home of Benguet Consolidated Mining Co., near Baguio, Mountain Province, P. I.



Sketches showing characteristics of veins, Benguet gold mine

ized zone. The andesite is covered with the later flow of another andesite, which as the result of weathering is found as remnant in blocks at the prominent height.

The deposit is a regular quartz vein banded and alternately lined with opaline quartz and consists of, in addition to quartz, some calcite and fine particles of iron pyrite. Pseudomorphs of quartz after calcite are noted at several places. To some extent vugs and druses are fairly well developed and in some places fragments of the country rock are included in the quartzy vein matter lined longitudinally, clearly indicating movement after the formation of the vein. The walls are rather well defined. The vein can be traced on the surface for a distance of 550 ft. The largest orebody is made up of a network of narrow veins and stringers cutting through propylitized andesite. Secondary quartz stringers cut across the vein, and I was told that gold occurs in largest amounts where the vein is intensely kaolinized or stained red with iron oxide and cut with the quartz stringers. The gold is fine and invisible.

A little prospect in a valley called Acupan Canyon is situated about five miles southwest of the Benguet Consolidated mine. The country rock is the same as in the Benguet, and the andesite is medium grained. Propylitization is just as intense here as at the Benguet, and near the vein the country rock is densely disseminated with iron pyrite. The deposit is a single quartz vein, which cuts through the andesite. The vein dips 70 deg., and the width is variable, but on an average is 4 ft. Gold occurs in fine state, and visible particles are found only in the dark bluish gray streak in the white quartz.

Another prospect near here belongs to Mr. Kelly, one of the pioneers of Benguet canyon gold field, and one of those few gentlemen in the Mountain district that have a real love of nature. In the heart of the mountains so remote from the outside world, it is always gratifying to find oneself in the atmosphere of hospitality peculiar to the American prospector. His solitary house is reached from Baguio in two hours on foot. At his claims the country rock is andesite, which is partly propylitized and peppered with iron pyrite. Several quartz veins traverse the andesite. The strike of the veins is not uniform, but all lie nearly vertical. The width is from 6 in. to 12 ft.—on an average, 3 ft.

An Entire Mountain Is Sliding

Of the quartz vein deposits in the islands the Palidan Slide gold mine is the most peculiar and most interesting. The reader is referred to an interesting article on the "Palidan Slide Mine," which appears in the *Philippine Journal of Science*, September, 1916, Vol. XI, No. 5, page 241, by V. E. Lednicky, formerly Chief of the Division of Geological Survey, Manila. The mine is

situated a few miles south of the Mancayan copper mine and about half a day's walk from a village called Cervantes, in Suyoc, Mountain Province. The mountain top is caved in and is approximately the shape of an amphitheater, whose diameter is 2,000 ft. at the widest point, and is more than 500 ft. deep. This crater-like depression is a mass of highly propylitized andesite and is constantly in process of disintegration. The country rock is disseminated with fine particles of pyrite and the whole moving ground is in a mass of yellowish or greenish blue clay. A strong odor due to the constant oxidation of the pyrite can be detected. The "crater" rim is fissured in all directions and is constantly moving down toward the lower outlet; and the whole mountain may be said to be sliding! The lower portion of the slide is literally honeycombed with a great number of small pits and dugouts sunk by industrious Igorots. Gold is said to occur mainly in gypsiferous quartz stringers. Propylitization of the andesite is as extensive around here as at Baguio, about 50 miles south, and such geological process must be directly related to the deposition of innumerable gold-quartz veins.

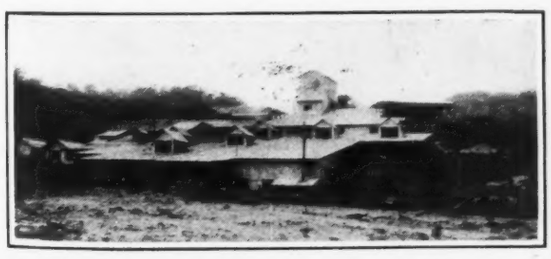
Iron-Ore Deposits in Camarines and Marinduque Island

The iron deposit of Camarines is situated near the barrio of Mambulao, a small fishing village of 1,500 population. From Manila it is distant eight hours by rail and another eight hours by steamer. The main orebody forms the backbone of the Larap Peninsula, and extends farther north to Calambayanga Island. Although both the peninsula and the island are thickly covered with heavy tropical vegetation to the edge of water, outcrops of iron ore can be traced in a fairly well-defined continuous line for a distance of 4,500 ft. The ore is non-crystalline, and is porous near the surface of the ground. At some places it is cut with fine stringers of quartz and shows traces of pyrite and chalcopyrite, especially near the contract with the diabase dike. It is rather homogeneous in composition and in texture throughout the entire thickness exposed, which was estimated to average 12 ft. on the island. An average analysis of 32 samples gave the following:

	Per Cent		Per Cent
Iron	63.89	Sulphur	0.06
Silica	1.78	Water	9.27
Alumina	6.30	Manganese	0.31
Phosphorus	0.14		

It is rather difficult to make even a rough estimate of the ore reserve from the few data available. The ore in sight as traced out on the island and on Larap Peninsula may be roughly calculated at about 600,000 tons at Larap and 138,000 tons at Calambayanga Island. Preliminary exploration by trenching or boring must precede an attempt at commercial exploitation.

In an unexplored part of Marinduque Island, about 10 miles inland from Maopog, a little fishing village on the west coast of the island, is a deposit of magnetite. The rock, which is extensively developed, is a basic diorite. Its texture is variable, and in some places it is porphyritic. It is cut at several places by a liparitic rock, which contains fine particles of iron pyrite.



Syndicate Mining Co.'s cyanide mill, on Masbate Island

Sketch map showing location of mines and prospects near Aroroy, on Masbate Island

The ore deposit in sight consists of about forty large, rounded water-worn blocks of magnetite, some of them 40 ft. in diameter, that are scattered and intercept the stream course. On the left bank of the stream a vertical contact between the magnetite orebody and the country rock is shown. The diorite near the contact with the ore deposit is much dark colored, assuming almost a diabasic character, and is cut with numerous stringers and veinlets of magnetite. The ore is almost pure magnetite, and only near the contact with the diorite a few specks of pyrite and green copper stain can be noted. The relation of the deposit and the country rock strongly suggests its being of magmatic origin.

About 5½ miles from Aroroy, on Masbate Island, and not far from the two well-known gold mines, the Colorado and Syndicate, are located mineral claims covering the outcrops of a manganese oxide deposit. The country rock is a basic diorite. The manganese oxide orebody lies flat on top of the diorite, with a gradual transition, and is 10 ft. thick. The ore is, in general, steel gray, massive and dense; its texture is homogeneous.

Average analyses taken at three different claims show manganese 47.95 to 50.26 and silica 14.19 to 13.81 per cent.

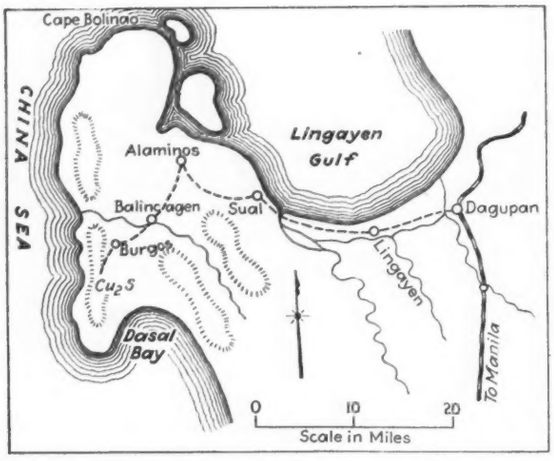
The foregoing analyses show that the mineral is perhaps braunite. A manganese deposit of apparently similar origin and nature was seen in the trip in Pangasinan between Sual and Bulgos, where also the country rock is a basic diorite.

Coal Is Imported At Present

Industry in the islands is much handicapped by lack of a good domestic coal supply. It has, however, been reported recently that discoveries of coal have been made in Mindanao, but I have not had an opportunity to examine them.

It is reported that investigations of the Philippine coal deposits have indicated that all the coals in the islands are brown coal, metamorphosed into better grade by the intrusion of igneous rocks; and that coking tests have failed and that coking coal never will be found in the Philippines.

An exception to this conclusion has recently been announced from a village in Cebu Island. Near a Visayan village called Barrio Pauting Bato, on the Island of Cebu, coal outcrops at several places for nearly 10 miles. The basal rock exposed is a dark-colored diorite, on which lies unconformably a series of sedimentary rocks consisting of coralline limestone, clay shale and conglomerate. A seam of coal is located between an upper shale and a sandstone bed, and two more



Map showing location of deposit of copper sulphide (Cu_2S) in Pangasinan Province, P. I.

seams are found in a lower shale. The age of the upper coal was placed at Miocene by Dr. Yabe[1], and the lower coal is supposed to be Oligocene. The thickness is not uniform, varying from a few inches to 4 ft., and on an average is 2 ft.

An analysis made by the Bureau of Science at Manila gave the following: Moisture, 1.47 per cent; volatile matter, 42.41; fixed carbon, 48.00; ash, 8.17; sulphur, 1.84; heat value, 7,405 calories. The coal has coking quality, and the coke made of this coal is light and has metallic lustre. The proven coal reserve is estimated to be only 8,000 tons. If a greater reserve of coal of this grade be found, it may revolutionize the industry of the islands.

In the least explored region of Marinduque Island, in the upper valley of Rio de Boac, there is a small prospect of chalcopyrite ore, only a third of a mile above the magnetite deposit described on p. 721. Here the vegetation is dense and the jungle is almost impenetrable. The stream channel is narrow, and deep with abrupt cliffs. There is no trail of any kind, and the intruder is forced to wade the acid sulphated stream. The ore mineral is disseminated chalcopyrite in a quartz vein. Other quartz veins contain no ore mineral. The result from rough sampling and hand picking shows 8 per cent in copper when picked ore represented 15 per cent of the total width of the vein.

A chalcopyrite deposit in Pangasinan Province is so remote that even though it is situated within only 2½ miles west of the village of Aguilar, one must have a special native guide who knows every trail in the jungle. The country rock is a porphyritic diorite. This is cut by a quartz vein, which strikes east-west, contains a few specks of chalcopyrite and pyrite, and is stained green and red with carbonate and oxide of these sulphides. The vein is between 3 in. and 3 ft. wide and dips north at 60 deg. The prospect is unattractive in every respect.

Copper, Zinc, and Lead Sulphides Deposit in Marinduque

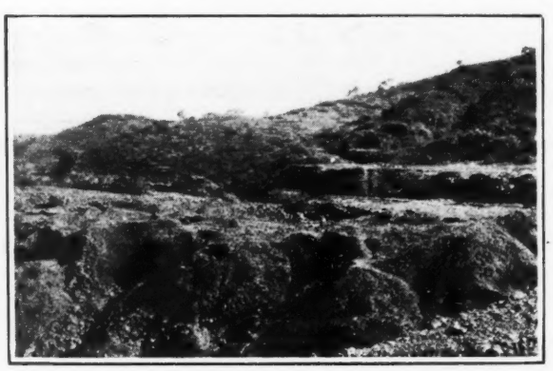
About three hours' walk from Port Santa Cruz, on the east coast of Marinduque Island, is situated a little barrio called Matuyo Tuyo, and thence another two hours' walk brings one to a barrio called Bayon. In a creek a quartz vein 40 ft. in width dipping 70 deg. cuts through the porphyritic andesite. The walls are sharply defined, and a portion of the vein is brecciated, including fragments of the country rock. The disseminated sulphides are pyrite, zinc blende, galena, and chalcopyrite. It is a poorly mineralized dike rather than a vein.

The most interesting and peculiar deposit in the Philippines was encountered near a village called Madampai, in Pangasinan. In a little depression a shallow pit exposes a chalcocite mass 6 ft. long and 2 ft. thick imbedded in a limestone. An iron-stained white quartz ledge outcrops for 300 ft. southwest of this chalcocite. Otherwise the country rock is all limestone, which appears to be rapidly disintegrating. The contact between the limestone and the chalcocite orebody is sharp, and no stringer or veinlet of the ore runs into the country rock. So peculiar is its presence in the limestone that I could not account for its origin or formation. It is simply a massive pure chalcocite surrounded on three sides with nothing but limestone. It is indeed a tempting prospect, and further exploration and thorough investigation are strongly recommended.

Mancayan Principal Copper Producer

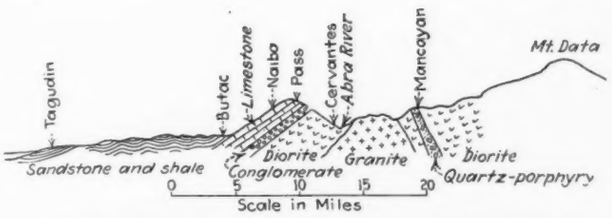
The Mancayan copper mine is in the village of Mancayan, in the Mountain Province of Luzon. It is about 60 miles east of Bauan Sur, the northern terminus of the Manila railroad, and is situated at an elevation of 3,600 ft. Authentic old records show that in the seventeenth century the mine already had produced some copper, and in 1850 the Spanish Government sent an engineer, Antonio Hernandez, to investigate. The quantity of metallic copper traded by the semi-savages with the Spaniards during 1840 and 1855 was said to be 281 tons. In 1856 a mining company was organized by Tomas de Balbas y Castro, who employed 120 Chinese immigrants. Up to 1875 the mine had produced 23,875,057 lb. of copper, or about 12,000 short tons. In 1904 the mine was investigated by A. I. Eveland and Maurice Goodman, and their joint report appears in Bulletin No. 4 of the Bureau of Science, Manila.

The rocks that make up the country near the mine are diorite, granite, quartz trachyte, quartz porphyry and rhyolite, and no sedimentary rock of any description is found. Diorite is the oldest rock and is composed of plagioclase feldspar and hornblende. At the contact with the quartz porphyry, which intrudes it, the rock is silicified and filled with disseminated fine grains of iron pyrite. Granite constitutes a great mass intruding into the diorite and makes most of the high mountains;



Slag dump of Mancayan copper mine, Lepanto, Luzon

[1]Science Reports, Tohoku University, Sendai, Japan, Second Series, Vol. V, No. II.



Ideal section between Tagudin and Mancayan

in certain places it includes basic masses of immense size. Quartz porphyry is the most important rock of the district, and is genetically related to the ore deposit. It intrudes the diorite and is 500 ft. wide and nearly 5 miles long. Rhyolite is supposed to be the outflow of the quarry porphyry and covers a part of Mancayan hill. Quartz trachyte is partly intrusive and partly extrusive, and is extensively developed. It intrudes into and also covers the diorite and quartz porphyry, without showing any contact metamorphism.

Genesis of the Copper Ore

The Mancayan diorite was intruded by the granite and the contact is now marked by the Magambang River. The contact zone between the granite and the diorite seems to be a line of weakness, and later igneous activities occurred along this line. Perhaps in post-Tertiary time, there came an active irruption of quartz porphyry, which broke through the diorite; the upper part flowed as rhyolite. This quartz porphyry shattered in the course of cooling and formed innumerable fractures, the general trend of which is in a northwest and southeast direction, along which hot ascending magmatic waters deposited quartz and some copper-bearing iron sulphide. Dynamic movements attendant on the volcanic activity followed in succession, shattering again and again the already dislocated and healed portions of the rock, and developing new fissures and brecciated zones. The ascending magmatic waters, containing mainly arsenic, antimony, copper, iron, barium, silicon, and sulphur gas, found easy access through these fissures and deposited as ore minerals, pyrite, luzonite, enargite, and tetrahedrite, in the order named. All phases of mineralization are illustrated, from fissure filling to dissemination, and in extreme cases replacement of the country rock by the ore minerals. Later came the trachyte flow, and the southeastern part of the district was covered to a depth of at least 150 feet. The last phase of the volcanic eruption is at present indicated by a salt-bearing hot spring at the northern end of the Mancayan Hill. An ideal section of the country between Tagudin and Mancayan is shown herewith.

An interesting fact is the occurrence of the rather rare sulphide luzonite, which constitutes the greater part of the ore. The ore minerals in the order of abundance are luzonite, enargite, tetrahedrite, and chalcopyrite. Luzonite, named after the Island of Luzon, is in composition the same as enargite. It occurs in massive form and its color is reddish bronze, resembling pyrrhotite instead of being steel gray, as stated in Dana's "A Text Book of Mineralogy." The gangue is quartz or barite. Luzonite is never found in crystalline form; it occurs as a coating, and fills small fractures and fissures in the fine grained silicified vein. Enargite crystals usually grow out of the luzonite mass, and are found with luzonite in many other ways in such an intimate relation that the luzonite and the enargite may be thought of as the same mineral, although the former is massive and the latter is crystalline form. The tetrahedrite occurs either in fine crystals or in massive form. The order of primary deposition is quartz, pyrite, luzonite, enargite, and tetrahedrite.

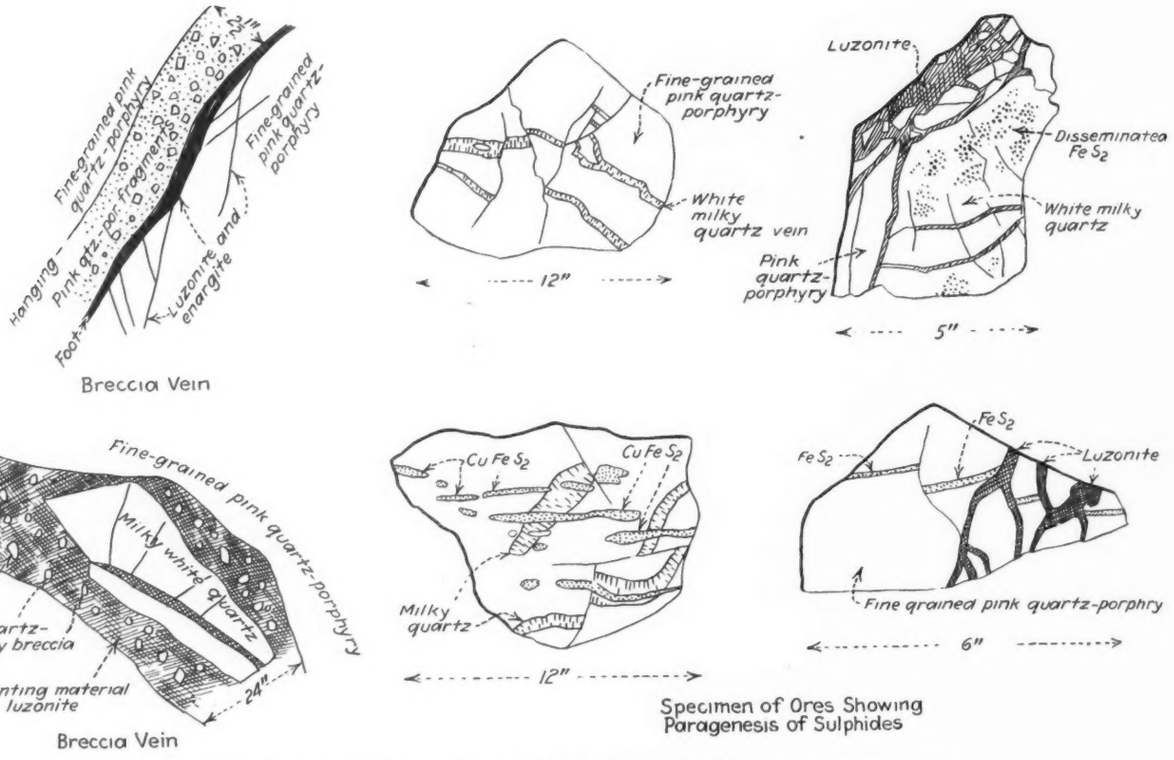
There are two systems of veins, one striking N. 50 deg. W. and the other N. 80 deg. E. The former system of the veins constitutes the main orebody. The major vein in this system is 1,000 ft. long. Southeast of the major vein several parallel veins group into one and form a bonanza shoot 250 ft. long, 70 ft. high and 50 ft. at the thickest point. The width of the vein is not uniform, and on an average is 4 ft. Successive movements at the time of primary ore introduction are remarkably well shown by fragments of the wall rock cemented together by the ore minerals luzonite, enargite, and tetrahedrite, forming what may be termed a breccia vein.

The covering of the trachyte flow over the ore-bearing quartz porphyry seems to have protected the primary sulphides from thorough leaching by underground waters. A close study in the underground workings revealed the fact that the dissolution and redeposition of the sulphides started only after the beginning of excavation in the underground workings near the surface, where the underground waters found free access. Some of the former investigators believe that the greater part of the ore is secondary, without, however, making any distinction between the primary and the secondary.

In the south and southeastern part of the extensive underground workings, some of which are noticed to have been stoped close to the trachyte flow, the ground water has produced remarkable results. Chains of green copper sulphate crystals and stalactitic gypsum hang from the ceiling, showing recent oxidation of the ore minerals, especially of the copper. The secondarily deposited sulphides can be distinguished by the order of deposition. In the primary ore the deposition of the sulphides is, as stated elsewhere, in the order: quartz, pyrite, luzonite, enargite, and tetrahedrite; while in the secondary deposit enargite seems to be the chief sulphide, and is deposited on the primary pyrite, usually with crusts of sugary white quartz.

The great bonanza which was the payable portion of the vein was long ago extracted, leaving only a small part of the vein, where a breccia vein of luzonite, 3 ft. wide, pinches out into the country rock.

A group of natives at the Mancayan copper mine, who helped in sampling



Sketches of characteristic specimens of ore from the Mancayan copper mine

A notable change in the grade of ore is shown only 100 ft. below, where the great bonanza orebody was extracted, the veinlets becoming less numerous and the ore-bearing quartz porphyry giving way to fresher rock.

A rough estimate of the ore reserve may be given as: proven ore, 300 tons, 4 per cent copper; probable ore, 3,500,000 tons, 1 per cent copper; and in the old dump, 5,000 tons, 3 per cent copper.

The mine is today too impoverished to be worked profitably. Nevertheless, its name as the biggest, most extensively worked, and, above all, the richest copper deposit, will remain in the record of mining in the islands.

Summarizing, it may be stated that the Philippines are yet undeveloped so far as minerals are concerned, although some the mines are many centuries old. A vast field is yet to be explored, and in this respect the gold placer fields in Luzon and Mindanao and the coal and oil fields in Mindanao may be suggested. Important gold vein deposits are confined to quartz or quartz-calcite veins in diorite or propylitized andesite. Mancayan has been the biggest copper mine in the islands, and perhaps there will never be found another copper deposit of that size in the Philippines. There is some possibility of discovering workable chalcopyrite deposits, and further investigation in Marinduque Island is suggested.

The pure chalcocite mass in the limestone in the northwestern part of Pangasinan Province is a puzzle. From its mode of occurrence, no explanation is possible for the massive siliceous manganese oxide ore deposit in Masbate Island other than a magmatic differentiation product, although such has never been described in literatures.

The Philippine coal belongs to Tertiary and is generally low in heat value. However, in some places the thermal as well as dynamic influences of Post-Tertiary igneous intrusions have indirectly improved the quality of coal, as at Pauting Bato, in Cebu Island. Philippine mining, metallurgical, and all other industries are much handicapped because of lack of fuel, and it may not be an exaggerated statement to say that the result of energetic exploration for coal and oil may decide the future destiny of the Philippine Islands.

Reclosing Equipment for Mines

In the article entitled "Reclosing Equipment for Mines," by E. L. Hough, which appeared in the *Mining Journal-Press* for April 4, 1925, equation 1 on page 565 was printed $e = \frac{E(R_x - R_L)}{R_r - R_L}$, through inadvertence. The minus signs in this equation should have been plus signs, so that the equation, thus corrected, should read $e = \frac{E(R_x + R_L)}{R_r + R_L}$.

South Dakota's Mineral Output in 1924

According to the annual report of Otto Ellerman, state mine inspector of South Dakota, the state's mineral production in 1924 had a value of $6,738,582. This was distributed as follows:

Gold, silver	$6,141,659	Bentonite	406
Lithia	53,833	Ardmorite	1,850
Mica	4,940	Andalusite	235
Feldspar	7,200	Quarry rock	428,428
Arsenic	3,156	Coal	55,683
Gypsum	41,192		

There were two gold producers, the Homestake Mining Co. and the Keystone Arsenic Co. The average number of employees at all metal mines was 1,712. Coal mines employed an average of 62 and quarries 230.

During 1924, 574 accidents occurred. Of these five were fatal, ninety-seven serious and 472 slight. Of the fatal accidents three were underground, one was in a mill, and one in a quarry.

Superseding Chemical Analysis by Specific Gravity Tests

How and When Laboratory Expense May Be Saved in Routine Work in Concentrating Plants

By Stüre Mörtsell

First Assistant Professor, Department of Mining Sciences, Royal University of Technology, Stockholm, Sweden

THE METAL CONTENT of a concentrator product may sometimes be determined to advantage by density measurements, a method whose practical applicability was pointed out by O. Witt[1] in 1900. The metal content is thereby considered as being a function of the specific gravity.[2] As a rule the variations of the metal content seem intimately to follow the change of the specific gravity of a concentrator product made by the same machine in a concentrating plant treating homogeneous material, even if the product in question be rather complicated in its mineralogical composition.

In an ore consisting of only one ore mineral and one gangue mineral, as, for instance, a quartz-striped hematite, the matter is most simple. The metal content of a concentrator product of any kind, obtained from such an ore, may under all circumstances be calculated directly from its specific gravity.

If m_1 indicates the metal content (in percentage) of the ore-bearing mineral,
m_2 the metal content of the gangue mineral,
δ_1 the specific gravity of the ore-bearing mineral,
δ_2 the specific gravity of the gangue mineral, and
e the specific gravity of the mineral mixture,
the metal content x of the mixture will be

$$x = \frac{\delta_1 \cdot \delta_2}{\delta_1 - \delta_2}\left[m_1\left(\frac{1}{\delta_2} - \frac{1}{e}\right) - m_2\left(\frac{1}{\delta_1} - \frac{1}{e}\right)\right] \qquad (1);$$

if $m_1 \cdot \frac{\delta_1}{\delta_1 - \delta_2} = k$; $\quad \delta_2 . k = k_1$;

$m_2 \cdot \frac{\delta_2}{\delta_1 - \delta_2} = k'$; and $\delta_1 . k' = k_1'$;

equation (1) may be expressed

$$x = k - \frac{k_1}{e} - \left(k' - \frac{k_1'}{e}\right) \qquad (2a),$$

and

$$x = K - \frac{K_1}{e}, \qquad (2b),$$

where $K = k - k'$ and $K_1 = k_1 - k_1'$.

This is the equation for a hyperbola, the asymptotes of which are the x-axis and a line parallel with the e-axis at a distance of $+K$ from the origin. In the generally occurring case of a gangue mineral with no metal content ($m_2 = 0$) we obtain

$$x = k - \frac{k_1}{e} \qquad (3).$$

Fig. 1 represents the hyperbola defined by equation (3). The curve may be used only between the points A and B. At point A the curve on the e-axis cuts the specific gravity δ_2, and the highest metal content is reached at the point B, the specific gravity being δ_1, when the ore-bearing mineral is perfectly free from gangue. The metal content may thus be determined directly from such a curve, provided the specific gravity is known.

The accuracy of this method depends upon the specific gravity of the individual constituents as well as on the accuracy of the determination of the specific gravity e of the mineral mixture. The latter may without difficulty be obtained with an accuracy of two significant decimals. In a mixture of hematite and quartz, for instance, a simple calculation shows that the iron content of a concentrate thus obtained theoretically ought

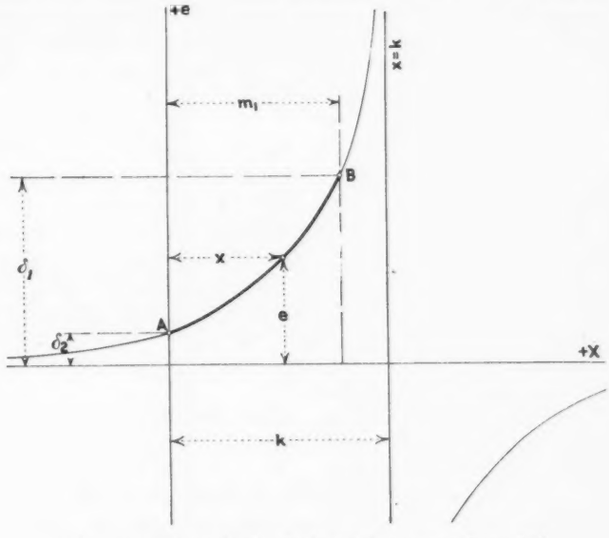


Fig. 1—Hyperbola defined by equation (3)

to be ascertainable with an accuracy of at least 0.1 per cent iron.

We thus obtain:

$$dx = \frac{\delta_1 \cdot \delta_2}{\delta_1 - \delta_2} m_1 \cdot \frac{de}{e^2}$$

If the concentrate be characterized in the following manner:

$$\delta_1 = 5$$
$$\delta_2 = 2.6$$
$$m = 70$$
$$e = 4.5$$

and the error in the estimation of e be ± 0.005, we get

$$dx = \pm \frac{5 \cdot 2.6}{5 - 2.6} \cdot 70 \cdot \frac{0.005}{(4.5)^2}$$

$$dx = \pm 0.092.$$

With a careful determination of e, the accuracy ought to be about 0.05 per cent iron, and with heavier ore-bearing minerals the result is even more accurate.

An example of the use of density measurements for determining the percentage of metal content is found

[1] *Teknisk Tidskrift*, Kemi and Berg, 1900, p. 42.
[2] A similar method is sometimes used for determining the content of tungsten in steel.

in an article by Roger W. Gannett, in *Mining Journal-Press* of Sept. 6, 1924, page 380. The ore bearing mineral here consisted of cassiterite, the gangue being tourmaline, hornblende, magnetite, and quartz, with some zircon, garnet, and spinel. The specific gravity of the tin concentrate was determined in this way: A flask filled with water was first weighed, and then again weighed after filling with a certain amount of material and water. The analysis was then obtained by a graphical chart, after the specific gravity of the gangue had been estimated, the contents of the metals entering being known. Already this proceeding appears to be somewhat dubious, but it is still worse because the table used is incorrect. Apparently the table has been based on the supposition that the curve which gives the correspondence between specific gravity and metal content is a straight line with the formula

$$x = m_1 \cdot \frac{e - \delta_2}{\delta_1 - \delta_2}$$

A numerical example shows best to what this leads. Supposing that the specific gravity of the gangue and the tin concentrate were 3 and 5.5 respectively, we find from Gannett's diagram a cassiterite percentage of 60. The last-mentioned equation gives a more accurate value, 61.2 per cent. The correct percentage, however, is obtained from the equation

$$\frac{100}{5.5} = \frac{x}{7.1} + \frac{100 - x}{3}$$

$$x = 78.7$$

The diagram of analysis ought evidently to be constructed on the basis of equation (3). If this is done we obtain the chart shown in Fig. 2.

According to this figure a cassiterite content, in the given example, of approximately 78 per cent is obtained.

To establish how far the analytical method in question may be brought into accordance with the above-noted theoretical speculations, the following investigation was carried out at the Royal School of Mines (Bergshögskolan) of Stockholm:

A small amount of hematite ore containing some quartz was ground. By washing on a small scale this material was then divided into different products, varying in size as well as in composition. Out of these, samples of 10 to 20 grams were taken, the specific gravities of which were determined by weighing them in air and water. The samples were afterward chemically analyzed for total iron. When weighed in water, the laboratory balance used was supplied with an extra scale, the balance thereby being equalized with a counterweight of exactly the same weight as the scale, immersed in water to a certain mark (Fig. 3). The values obtained are given in Table I.

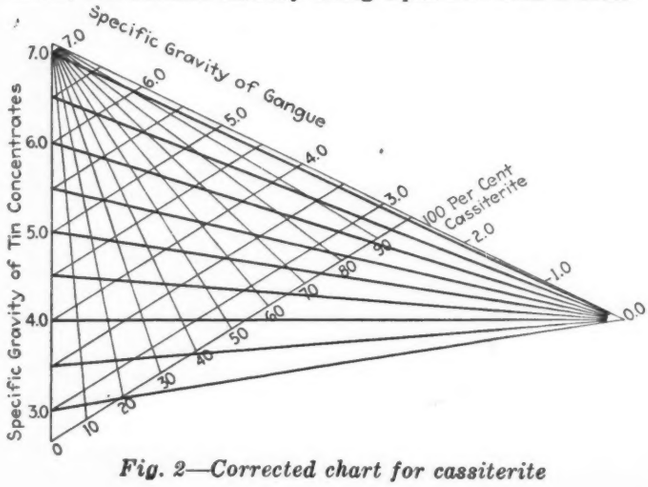


Fig. 2—Corrected chart for cassiterite

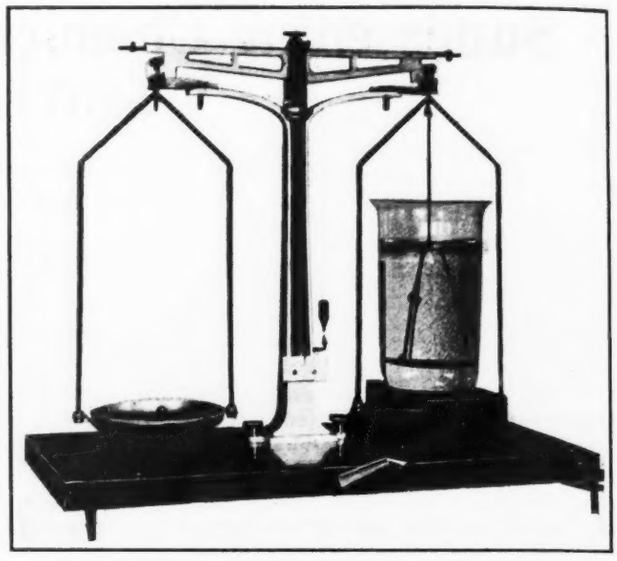


Fig. 3—Laboratory balance used in experiments

Table I

No.	Specific Gravity	Fe, Per Cent	No.	Specific Gravity	Fe, per Cent
1	2.88	14.30	6	3.78	43.95
2	3.20	24.45	7	3.92	47.50
3	3.37	31.10	8	4.01	49.25
4	3.37	31.15	9	4.73	62.35
5	3.56	36.25	10	4.83	63.95

Of the ore used for the investigation, about one-third of the iron mineral was magnetite, the remainder being hematite. Further, the ore contained not only some quartz but a not inconsiderable amount of feldspar, as well as traces of biotite. The minerals present may be characterized in the following manner:

		Fe, Per Cent	Specific Gravity
The iron-bearing mineral	hematite	70.1	5.19 to 5.28
	magnetite	72.1	4.9 to 5.2
The gangue mineral	quartz	....	2.5 to 2.8
	feldspar (orthoclase)	....	2.52 to 2.58

It is evident that the material does not quite fulfill the conditions on which equation (3) is based. As, however, the variation in iron content and specific gravity within the different groups of minerals is slight, the following may be stated approximately:

	Fe, Per Cent	Specific Gravity
Iron-bearing mineral	71.0	5.2
Gangue mineral	....	2.6

From this is obtained

$$k = 142.0 \quad \text{and} \quad k_1 = 369.2$$

The values given in Table I for x and e ought therefore to satisfy the equation

$$x = 142.0 - \frac{369.2}{e} \qquad (4)$$

On the other hand, it is possible, by the least square method, to calculate the coefficient for the equation which most closely follows the results obtained. This calculation gives

$$x = 141.74 - \frac{372.62}{e} \pm 0.80 \qquad (5)$$

The equation thus obtained gives the following values for the above proposed specific gravities:

$$\delta_1 \; 5.267$$

$$\delta_2 \; 2.629$$

Although the ore investigated contained more than two minerals, the theoretical and the empirical curve thus agree well with each other. This is also seen in

Fig. 4, in which the values observed as well as the curves corresponding to equations (4) and (5) have been marked. From equation (5) we find, however, the accuracy with which one single determination of the percentage of iron may be made with the aid of the drawn curve.

The mean error, obtained from the sum of the square errors, is 0.80 per cent iron, which greatly exceeds the limit of error before supposed for a material consisting of only two minerals. The heterogeneous nature of the ore, from the above-mentioned point of view, is hereby made clear.

The accuracy obtained seems, however, in many cases to be entirely sufficient, for instance, for adjusting or controlling settling tanks or tables. Determinations of a far greater accuracy may, however, be carried out even on ore of the kind here discussed, if we are satisfied with a suitable, minor part of the approximate main curve. This only on the presumption, though, that the change of mineral composition within this interval takes place according to given rules, as is true in most ore-dressing operations. In this very case, the last five products (Table I) were obtained from a small Wilfley table. If a calculation based on these observations is made according to the foregoing, the interval of the curve between 44 and 64 per cent iron, valid for the table, is obtained much more accurately, calculations showing the mean error to be ± 0.129.

The determination of the specific gravity was carried out with but a moderate precision, as the quantity weighed for the determination was small compared with the accuracy of the balance; also, the smallest mineral grains remained floating on the surface when the dry sample was immersed in the water. In the practical application of the method this source of error may easily be avoided. Therefore, it does not seem improbable that the iron content might really be determined with an accuracy of 0.1 to 0.05 per cent iron.

As a rule, it is difficult to draw general curves which express the connection between metal content and specific gravity, and this difficulty increases with the complexity of the ore. Usually it is impossible to get one general, and at the same time reliable, curve. When applying this method it is necessary, as in the example given, to get from a sufficient number of chemical analyses the curve, or the small interval of the main curve, which shows the variations of a certain product. If such analytical curves are drawn for each machine or each product of a concentrating plant, chemical analyses may thus mainly be substituted by specific-gravity determinations, which naturally are much easier to perform. The method may also be used with crude ore.

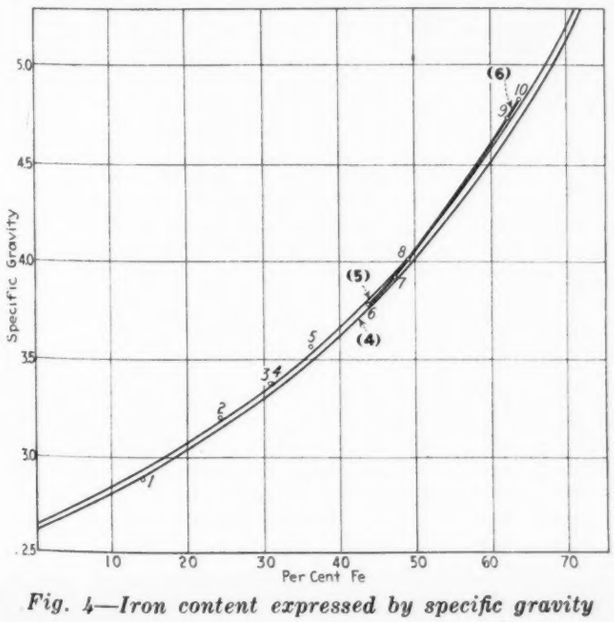


Fig. 4—Iron content expressed by specific gravity

However, even a general curve, obtained by simple means, may be of great help for seemingly very complicated concentrating ores, a fact which is evident from the following example:

At the concentrating laboratory of the Royal School of Mines (Bergshögskolan) of Stockholm an experimental concentration by washing gave the following products:

	Per Cent		Per Cent
Chalcopyrite	12.9	Cu	4.5
Pyrrhotite	14.6	Fe	28.0
Pyrite	32.5	Zn	1.0
Blende	1.5	S	28.0
Quartz	38.5	SiO_2	38.5
	100.0		100.0

Under the assumption of the following specific gravities and sulphur contents, a number of points of the curve were calculated which ought to give the relation between sulphur content and specific gravity as applied to the products of washing.

	Specific Gravity	Per Cent S
Chalcopyrite	4.2	34.5
Pyrrhotite	4.5	38.0
Pyrite	5.1	53.4
Blende	4.1	33.0
Quartz	2.6	....

The ore was supposed to be a mixture of quartz and sulphides. The sulphides could not be considered as a mixture of different minerals until the quartz had been removed by dressing. The following points may be sufficient to illustrate the curve:

1. Pure quartz:

$$x = 0 \qquad e = 2.6$$

2. The material employed:

$$x = 28$$

$$e = 100 \div \left[\frac{12.9}{4.2} + \frac{14.6}{4.5} + \frac{32.5}{5.1} + \frac{1.5}{4.1} + \frac{38.5}{2.6}\right]$$

$$= 3.59$$

3. Pure sulphides:

$$x = 28 \cdot \frac{100}{100 - 38.5} = 45.5$$

$$e = 61.5 \div \left[\frac{12.9}{4.2} + \frac{14.6}{4.5} + \frac{32.5}{5.1} + \frac{1.5}{4.1}\right] = 4.71$$

4. Pure pyrite:

$$x = 53.4 \qquad e = 5.1$$

The continuous line in Fig. 5 denotes the curve obtained in this manner. For control, four of the products obtained in the experimental concentration were analyzed for sulphur, the method giving an accuracy to 0.5 per cent sulphur. They were:

Size of the grain	Concentrating Machine	Kind	Per Cent S	Specific Gravity
2 mm.	Table	Concentrate	43.9	4.48
2 mm.	Table	Second product	24.0	3.32
2 mm.	Table	Second product	18.0	3.11
3 to 4 mm.	Settling tank	Concentrate	36.4	4.09

Plotted, the points are somewhat below the approximately calculated curve, and the curve valid for the ore was thus supposed to be about in the position of the dotted line in Fig. 5.

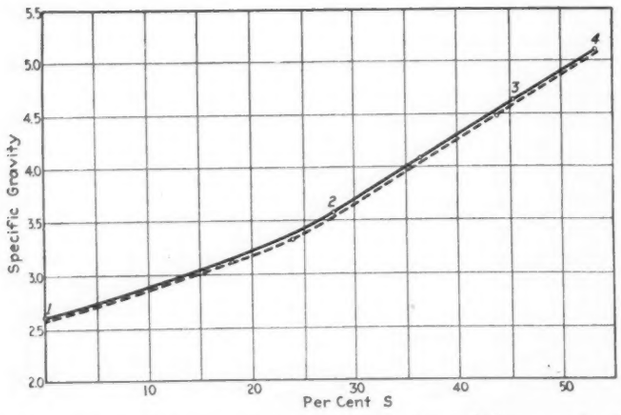


Fig. 5—Relation of specific gravity to sulphur content

The products that were the result of the experimental concentration were then determined only with the aid of the curve, obtained in the manner just mentioned. Altogether, forty-five different products were secured, the sulphur contents of which were determined in this way. Afterward, when the total sulphur content of all the products was summed up, 98.2 per cent of the original sulphur content of the raw material was accounted for. This result shows that the analytical method used was satisfactory for determining the sulphur content of the different products obtained, and it was also satisfactory for forming an opinion of the entire course of the experiment. It is only necessary to indicate the great errors of weighing and treatment which may arise during the course of the concentration.

Further, the silica content of all the samples was determined by means of a silica curve, drawn in an analogous manner. When added up, as much as 95 per cent of the silica could be accounted for, even this being a perfectly satisfactory result.

To determine the copper contents, empirical curves were drawn for different sizes of the grains, with the aid of a number of chemical analyses for copper, the copper content being supposed to be a function of the sulphur content.

From the examples cited it is evident that analyses may often be obtained, directly or indirectly, from the specific gravities, with an accuracy sufficient for the purpose. Now, what is to be gained thereby? The advantage is evident when dealing with metals which are difficult to analyze. The determination of total iron is, on the other hand, relatively simple to make. One thing, however, is to be remembered: For chemical analyses the samples taken must be crushed, and separated into smaller parts, these then being finely ground. Great errors are likely to occur in so doing if particular care be not observed. If the specific gravity is taken as a basis for the analysis, this source of error is eliminated, and at the same time the unavoidable and generally slow work of crushing and grinding is avoided. These advantages appear to me to be great enough to give reason for some detailed investigations at some of our concentrating plants, so that the applicability and accuracy of the method under different circumstances might be tested. The application of the method ought then to be carried out under the following conditions:

The measuring of the volume, necessary for the determination of the specific gravity, may be carried out either directly in a measuring flask, filled with water, whereby the volume of the displaced fluid is directly measured, or by weighing the sample in air and water. The use of a measuring flask is naturally more simple, but the accuracy when measuring the volumes in question is decidedly less than that obtained by weighing.

The determination of specific gravity by means of a pycnometer gives good results, however. If the sample is large, it is possible to use as a pycnometer a big flask, of thick glass, such as is made for acids, with a ground stopper of the ordinary type, as used for laboratory purposes. The inconvenience is that difficulties are likely to arise when the material is placed in and withdrawn from the pycnometer. Besides this, the air bubbles are difficult to remove. Usually, direct weighing is therefore to be preferred, even if the external arrangements thereby become somewhat more complicated. The balance used must therefore first be arranged so that the greatest possible quantity of goods may be weighed with the necessary accuracy. One of the scale pans may therefore with advantage be formed into a cylinder. It is best to have exchangeable scales, one for weighing the dry sample and one for the weighing in water. The scale pan of the latter must then be suspended by the thinnest possible thread, partly to lessen the surface tensions arising and partly to enable a careful balancing of the scale, immersed in the water. (See Fig. 3.)

To prevent surface floating, to which certain minerals are liable, from influencing, and also to assure that all air bubbles are removed, the weighing in water ought to take place first. The scale (eventually the pycnometer) is thus filled with the wet material, obtained directly from the washing apparatus. To remove any air bubbles possibly still remaining, the mass is stirred, after which the scale is immersed in water, and the balance arm is hooked on. For especially careful determinations the wet sample ought to be placed under reduced pressure to make sure that all air is removed. A correction ought further to be made for the temperature of the water above 4 deg. C. After having been weighed in water, the total amount of material is then dried and weighed. The determinations may be carried out on any scale according to the size of the samples—on the most accurate analytical balances as well as on big laboratory balances, intended for weighing one or several kilos. The chemical analyses must be made with great care.

New Industrial Films

Three new motion-picture films relating to the mining industry have been made by the General Electric Co. These films, entitled "Anthracite," "Bituminous," and "Pillars of Salt," are a part of a motion-picture service maintained to give educational information on industrial progress.

"Anthracite" and "Bituminous," beginning with a portrayal of the methods employed when the first mines opened, more than a century ago, show the principal operations in the mining and preparation of coal by modern methods. The various methods employed in mining are so presented as to give the lay spectator a better understanding of the industry. "Pillars of Salt" shows how salt is mined and refined. The film was produced at one of the largest mines and refineries in the country.

Useful Operating Ideas

Design of Skip Wheels

Manganese skip wheels have been used at the Plymouth mine, in Plymouth, Calif., since the beginning of operations. These were of the solid type, and when worn on tread and flange, the entire wheel had to be junked. To avoid this sacrifice of good metal a new design was made by Stanley L. Arnot, superintendent of the Plymouth mine. This design, shown in the accompanying illustrations, makes use of a cast-iron wheel with a replaceable manganese-steel tread. The wheel is cast with an oil collar, access to which is provided by a $\frac{3}{4}$-in. screw plug. The bearing is equipped

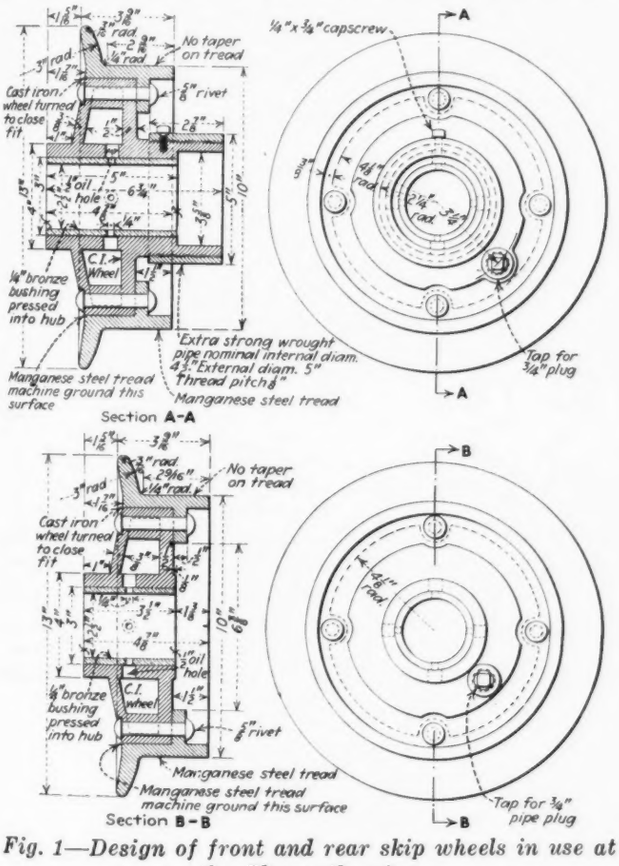

No taper on tread
Cast iron wheel turned to close fit
5/8" rivet
1/4" bronze bushing pressed into hub
C.I. Wheel
Manganese steel tread machine ground this surface
Manganese steel tread
Section A-A
1/4" x 3/4" capscrew
Extra strong wrought pipe (nominal internal diam. 4 1/2" External diam. 5" Thread pitch 8")
Tap for 3/4" plug
Section B-B

Fig. 1—Design of front and rear skip wheels in use at the Plymouth mine

with a $\frac{1}{4}$-in. bronze bushing. The outer tread with flange is of manganese steel and is fastened to the wheel by four $\frac{5}{8}$-in. rivets. This is replaced when worn down. Thus journal and tread wear falls upon replaceable parts.

The front skip wheel is similar in design to the rear skip wheel, but has a piece of extra-strong wrought-iron pipe threaded on the hub of the wheel and held by a setscrew. This part receives the wear caused by the dumping angle iron. The wrought-iron pipe was found to wear out too rapidly and manganese-steel cylinders have been designed to take its place. The design of dumping angles and dumping hooks is shown in Fig. 2.

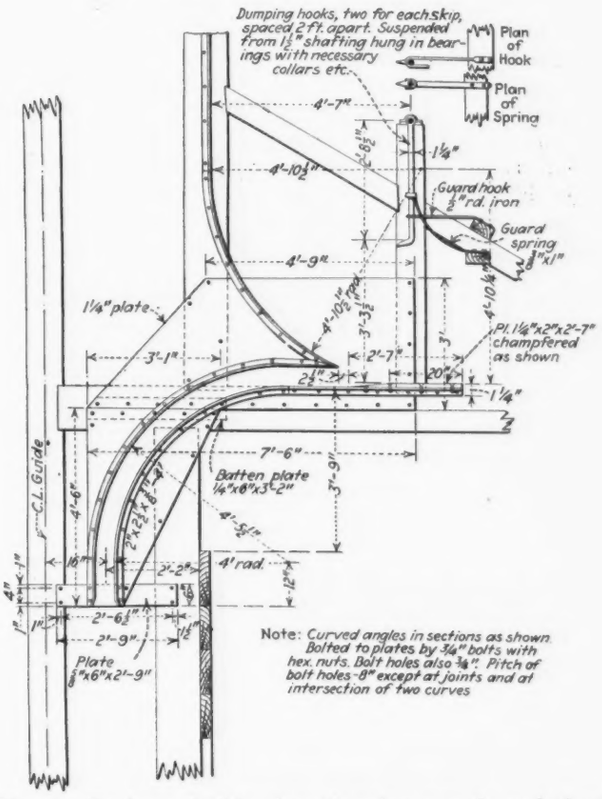

Dumping hooks, two for each skip, spaced 2 ft. apart. Suspended from 1 1/2" shafting hung in bearings with necessary collars etc.
Plan of Hook
Plan of Spring
Guard hook 3/4" rd. iron
Guard spring 3/8" x 1"
1 1/4" plate
Pl. 1 1/4" x 2" x 2'-7" champfered as shown
C.L. Guide
Batten plate 1/4" x 8" x 3'-2"
Plate 3/8" x 6" x 2'-9"
Note: Curved angles in sections as shown. Bolted to plates by 3/4" bolts with hex. nuts. Bolt holes also 3/4". Pitch of bolt holes 8" except at joints and at intersection of two curves

Fig. 2—Design of skip dumping irons and angle-iron guides used at the Plymouth mine

This arrangement of swinging hooks to catch the front of the skip in the dumping position is unusual, but has given satisfactory service for a number of years.

Improving Precipitation Pump Efficiency

By A. P. Carter

According to the usual practice in precipitating cyanide solutions containing silver, the rich zinc-silver precipitates pass through the solution pumps, and as a result the precipitate in suspension gums up the valves of the pumps and cuts out the plunger packing. The efficiency of the pump is materially reduced. To maintain reasonable efficiency it is necessary to clean the valves and seats frequently, and also to renew the valves and packing at intervals. The design of the Merrill precipitation equipment is such, and also by reason of custom, that it has always been considered necessary to feed the zinc into the pump suction pipe.

While I was employed at one of the mill units of the American Smelting & Refining Co., it occurred to me to bypass the zinc-dust emulsion around the solution pump, thus eliminating the pump troubles. To accomplish this, L. W. Lennox, at the Veta Grande unit of the American Smelting & Refining Co., at Parral, and L. W. Allen, for the San Rafael y Anexas mill, at Pachuca, have installed small plunger pumps connected

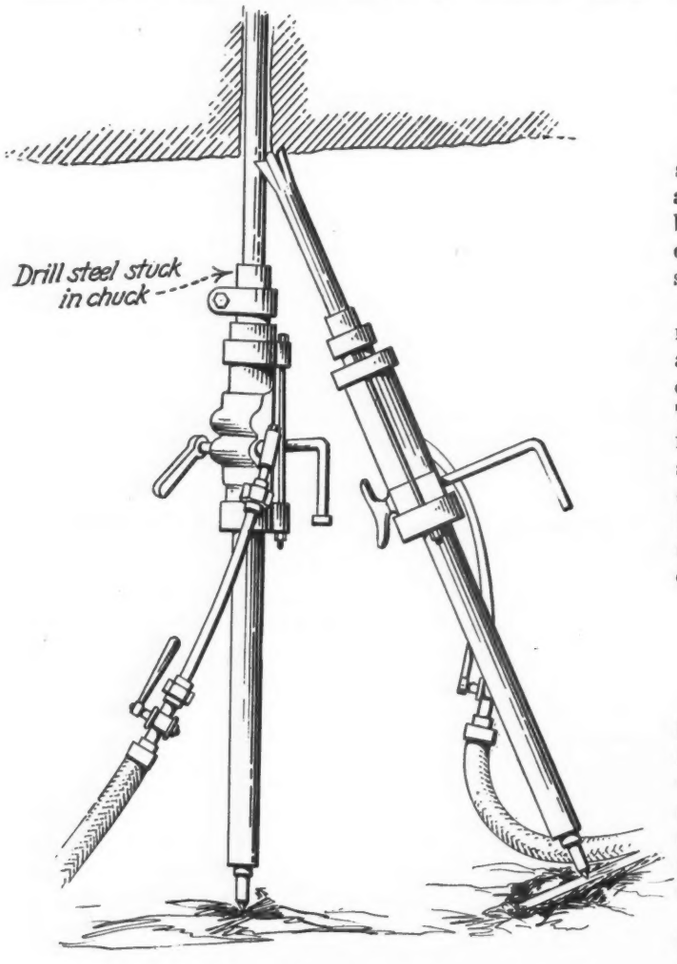
to the zinc-emulsion cone, to feed the zinc dust to the solution current passing from the discharge of the solution pump to the presses. These small pumps require little attention, work satisfactorily, and have been the means of saving the labor for cleaning pump valves as well as the cost of the frequent renewal of valves, packing, and scored plungers. The solution pump also retains its efficiency for twenty-four hours daily, equaling that of any pump working under clean water or clear solution conditions.

The foregoing method for feeding zinc dust is not required in the precipitation of gold solution nor for low-grade silver solutions, carrying 50 or 60 grams. Experiments are being made with rotary pumps to take the place of the small plunger pump, and I expect to publish the results of this work as soon as the experiments have been completed and the efficiency of this type of pump has been demonstrated.

Removal of Drill Steels from Chucks

By Ira Limmen

When a drill steel has become rigidly stuck in the chuck of a stoper drill, the stoper is usually, as a last resort, sent to the blacksmith shop. A more direct method is as follows: Another stoper from a nearby

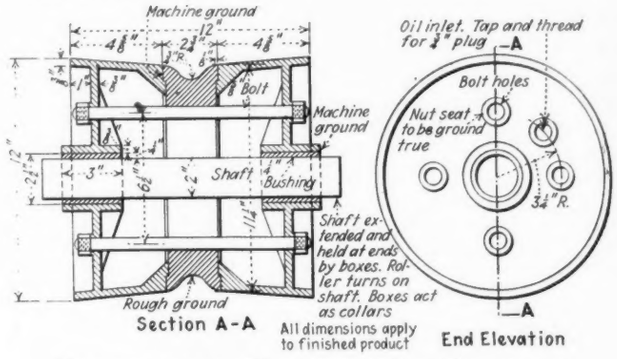


One way of loosening drill steel that is stuck in the chuck

working is obtained and a short steel starter is inserted in the chuck. The second stoper is placed in position, and the starter forced against the stuck drill steel at the collar of the hole. This secures the first machine in position and allows its weight to hang upon the steel. The air is then turned on, and the blows of the hammer quickly release the stuck steel.

Self-oiling Shaft Roller

A composite shaft roller of manganese steel and gray iron, designed by Stanley A. Arnot, superintendent of the Plymouth mine, at Plymouth, Calif., is used in the Plymouth shaft and has given excellent service. The shaft, which is vertical above the 1,600 level, joins an incline extending to a depth of 4,378 ft. measured on the incline. The bottom of the sump is 3,920 ft. vertically below the collar.



Maganese-steel self-oiling shaft roller used in Plymouth mine, Plymouth, Calif.

The rollers at the turn of the shaft are subjected to severe service, and designs have been changed until a satisfactory type was evolved. Shaft rollers should be as light as possible and should require attention only at infrequent intervals. In other words, they should function automatically over long periods of time.

The roller is made in three pieces, an inner bearing ring of manganese steel, grooved to receive the rope, and two outer drums of cast iron which provide sufficient width to take care of the lateral play of the rope. The drums and the central ring are held together by four ⅞-in. bolts. The 2-in. shaft is stationary and is supported by boxes which act as collars. The bearings of the roller are bushed and are each 3 in. long. A ¾-in. opening, closed by a plug, is provided for introducing lubricating oil, which partly fills the inner chamber.

Care of Leather Belting

By Allen P. Child

When the natural oil has been exhausted from a leather belt it becomes harsh and dry. Great care is necessary to restore it to proper condition. By rubbing with coarse cloth the belt can be thoroughly cleaned of surface dirt. If necessary, kerosene or naphtha may be used to complete the cleaning. Where the belt is particularly dry and dirty a scraper should be used. A wooden block with a sharp edge will also do the work.

Too much dressing on a belt is worse than too little. Belting companies advise putting more dressing on the outside of the belt than on the pulley side and in amount only what the belt will absorb readily. The object of dressing a belt is to make it soft and pliable and not oily and sticky, as is done by many who pour the dressing on without regard to how much is used or how often the belt is dressed.

Discussion

Scouts for Exploration Companies

THE EDITOR:

Sir—Your editorial on "Exploration Companies" in the issue of the *Mining Journal-Press* of March 7 prompts comment which, I hope, will be of a constructive nature. From observation spread over many years it has seemed to me that the methods of the average exploration company leave much to be desired.

The common process seems to be to send an engineer from headquarters, which is usually in some town, to examine a property which has been offered by its owner or by another interested person. The engineer arrives at the property, usually sees little that is worth looking at, and then makes his way back to the comforts of the city. Now, this method has little chance of producing good results. In the first place, the chronic claim seller absorbs a large part of the engineer's time, and the same worthless property is examined over and over again by the different companies.

This method has the further disadvantage of making the engineer the guest of the claim owner, which results in his seeing little of the district outside of what the prospector wishes him to see, as the unwritten and unspoken prospector's ethics of leaving the other prospector's visitors alone is seldom disregarded. Hence between his guides and his haste, he sees little but what has been placed before his eyes.

It is my experience that any real mineral district requires a close and often detailed study to investigate even a part of its possibilities. The visits of the engineer are ordinarily too short to even begin this work. Today if mines are found the first step will be to see more than the fellow saw who came before.

That there is a vast difference between the appearance of a prospect with a few shallow holes, or no holes at all, at the surface, and a developed or half-developed mine, is at least vaguely realized by all concerned with the finding of ore. Though attention has been paid to outcrops in the literature of ore deposits —and in the case of copper they have been closely studied—it may be said that no class of men has been developed which has made a broad study of surface conditions with the idea of finding ore in general. The reason for this, no doubt, has been that to make such a study, which extends far beyond the mere study of outcrops, it is essential that the student spend many years in the field observing mineral districts, near districts, and simple allegations of districts. This involves labor, expense, and a life that sometimes borders on hardship. It is getting very close to the plane of the simple prospector, while at the same time, demanding that the student have such a knowledge of the economic geology of the day as will enable him to use it to the full.

Assuming that the proper man is available, the next step consists of getting him into the field and keeping him there. This will mean moving from place to place by the best conveyance at hand, camping out when requisite, avoiding big jumps, and entering districts unheralded, unannounced and often by the back door. By this means, paradoxical as it may seem, the visitor will get the "keys to the city," and will be able to browse without a halter, and will hear much, and see much, that is carefully hidden in the innermost cells of the "old timer's" brains.

Also, no one knows the financial power of the "scout." He may look as poor as he pleases, which is often a valuable aid in securing terms. Moreover, he is a free agent and open to offers from everyone, thus giving him all the advantage that competition may afford. Faulted orebodies, untouted prospects, unsampled outcrops, even virgin country, will demand his attention, and despite the utmost vigilance and energy, your scout will look back upon the various districts that he has left behind and say: "Why didn't I look at this, that, or the other thing?" I will venture to say that productive deposits will be found in many places where the exploration companies cited in your editorial have failed to find anything, and it seems incredible that, if men skilled in "exploration" are put into this work and kept there, such poor results will not be immensely improved. CHARLES A. PORTER.

Philadelphia, Pa.

What Is the Matter With Mining Schools?

THE EDITOR:

Sir—It is easy to be altruistic, theoretical, and hidebound with the strictest etiquette, to have the high ideals and the intelligent outlook of the mining engineers of the past, when one is getting a salary of $400 to $1,000 or more per month, or is working for an opportunity for advancement; but when the short-sighted business man takes advantage of war conditions and the ravages of the adjustment period succeeding war, and pounds the salary of these same men down to $150 or $200 per month, pounds them down to that of the illy paid teaching profession, pounds them down to less than that of good mine foremen, classes the brain and courage of the engineer—mining or other—as labor, and proudly boasts, as some of them do, that business men do not need brains, that they can buy them, what then?

Is it any wonder that the young man, hearing all these things, and living, as he does, in an age of extravagance, when he knows that he must have the "coin" to "keep up a front," should hesitate? Will any curriculum attract? Even the thrills and the fascination, the good health and the clean life, of a mining career cease to have an attraction.

When the professor of a mining course at a leading college prefaces his appeal for his course to the freshmen class with the words: "Mining is a great profession; it is a great character builder; it furnishes a clean life; it calls for the very best that is in a man;

but I want to warn my prospective candidates that it calls for great sacrifices, and as a result of my life experience I want to warn you that the man intent on marrying and establishing a home life had better not adopt it. Experience shows that his lot may be cast in small places and under the squalid conditions of a mining town; it will be very difficult to make a woman happy there, and the salary an engineer now receives will not permit him to ameliorate these conditions or allow him to send his children away for a better education."

The fault is not in the mining schools; nor has the appeal of the life of the high class of talents demanded of the mining engineer changed. The fault is with the business man who declares that he can buy brains and is trying to buy them for a "mess of pottage"; and we spoke advisedly when we called him short sighted. He is driving the young talent that we formerly got away from the mining schools.

This is a materialistic age, and the young men are going in directions that promise them a reward for their efforts and a chance for their ambitions. An unambitious man has no real place in mining: the right man will put up with anything, face any condition, endure any hardship, if he knows that he has a chance to reap his reward. But when you tag on to the awful chances that a mining engineer has to take with nature and nature's secrets the additional facts that at fifty years of age he may have a family, that the pay of his thirty years' service has never given him the opportunity to save or to invest, that he may still be in his prime, but is met with the avowed policy of the business men that fifty years is a dead line with them and he must be put on the shelf; what then?

This sounds pessimistic and is—for the present decade—but the law of supply and demand will operate irrevocably here, as in all cases. In ten years' time there will be no young engineers of the class that has made our present engineers famous, and engineering will again come into its own. Our older men will have retired and there will be no one to replace them; talent will have to be created, and when created will be bid for, and mining, under new conditions and requirements it is true, will have to be reconstructed from the depression which mediocre talent will have thrown it into.

At present we are obsessed with "the selling game." We hear a great deal of rot about the advantages of selling as an occupation; we are "sold" on this idea or that; they even talk of making selling a profession. Selling is just as important now as it always has been and always will be—no more and no less; but it is being boosted so much now and such inducements are offered that it is drawing much of the talent that we used to get.

When we have sold everything we have and the market is glutted with "sellers" we will awaken to the basic fact that production is the important thing and that we must have economy in production and good products, if anyone is to sell them. When that time comes engineers will come into their own again, and talent in production will be better appreciated, better rewarded, and the engineering schools will again attract.

Anyone who makes a study of the top-heavy, uneconomical, lazy office forces of most of our present big trusts and big businesses knows that there will be a great opportunity for talent and brains in the future, and in that day, ten years distant, when business becomes fiercely competitive, and the little economies count more than they do now, men trained as they know how to train them in the mining schools will be eagerly sought, and then we will get our men back into the mining schools.

SAM HUGH BROCKUNIER.

Pittsburgh, Penn.

Dynamite and Hard Work

THE EDITOR:

Sir—I have been following closely the letters in your journal relative to the development of new mines. From expressions of opinions by certain development companies, and from conversations with mining engineers representing some of the large mining interests, a person unacquainted with the facts might come to the conclusion that all of the mines of any consequence had been discovered. Some time ago you referred to the fact that the Barnes-King Development Co. was about to dissolve and distribute its assets on account of its inability to find a mine, and this has been referred to in several communications in your valuable journal. I wrote to the Barnes-King management about a year ago in regard to a mining property with silver and lead as its principal mineral, and in reply was informed that the company did not care to handle anything except a gold mine. It would seem that strictly gold mines are hard to find, and there is a good geological reason for this. On account of the fact that gold is slightly soluble, it is usually about as rich at the surface as it is at depth—or richer, even. Such being the case, it may be possible that the best gold mines have been discovered and worked.

But what about the big iron and quartz gossans carrying small percentages of silver, lead, and copper at the surface with which the Rocky Mountain region abounds? As Percy Williams says in your issue of April 11, the only way that anyone can say what is below is by dynamite and hard work. I live not a great distance from the famous Granite-Bimetallic mine, which produced about $32,000,000 and which for the first two or three hundred feet consisted of a poor, iron-stained quartz so deficient in values that the location was allowed to lapse several times before it was finally developed. Under present conditions a mine of this character would not likely be developed.

The pioneer of the West, whether miner, stockman, or farmer, had to have imagination and be able to visualize the future, and, having this, he took a chance. Today the romance has gone, and mining is considered as a manufacturing business in which a certain amount of raw material in sight is to be manufactured into a certain product. I personally know of many good surface showings, but what would occur at depth neither I nor anyone else could say definitely.

There may be people who are still willing to take a chance on properties of this kind, but they are not found in the so-called development companies or among the mining engineers representing the large companies. It is far safer for them to turn a prospect down, and, like the erring physician, have their mistakes buried.

The published reports that development companies cannot find a new mine are very detrimental to the growth of the mining industry, and I think, with some of your other correspondents, that the trouble is principally lack of the use of dynamite and hard work.

Hamilton, Mont. H. C. PACKER.

Consultation

Asbestos Production of South Africa and the Grades Marketed

"Please inform me as to the amount of asbestos produced in the Union of South Africa. If you have the information, I would also like to know how the product produced is graded and classified for the market."

The Union of South Africa is not so important an asbestos-producing country as Rhodesia, which lies further north and is an important competitor of Quebec asbestos companies. However, good merchantable grades of asbestos are produced in the Union that find a ready market not only locally but also abroad. The three commonest varieties of asbestos found in the Union of South Africa are chrysotile, or white asbestos, which occurs in the Transvaal and Natal in the Carolina and Barberton districts, where it is being mined. Secondly, crocidolite or Cape "blue" asbestos, which is found in the northern part of the Cape province and is a lavender-blue color, and, finally, the variety known as amosite, an ash-gray ferrous silicate hornblende.

Data as to production are contained in an interesting paper by A. L. Hall, in the November, 1924, issue of the *South Africa Journal of Industries*, which gives the following figures of production for the various provinces of the Union:

Production of Asbestos in the Union of South Africa

	In Short Tons			
	Cape Province	Transvaal	Natal	Total
1919	3,204	631	98	3,932
1920	3,525	3,542	45	7,112
1921	3,467	1,593	62	5,122
1922	2,991	1,392	5.5	4,389
1923	4,317	4,075	....	8,392

Compared with the asbestos production of Rhodesia this output is moderate. Rhodesian production amounts to about 25,000 tons per year. The chrysotile average run-of-mine material is in the form of fibers one-quarter to one-half inch long in the Carolina district. In the Barberton area about 300 tons per month of asbestos is being produced, with the production rising. The following grading is used by one of the producing companies in that field and is taken from Hall's paper:

Grades of Chrysotile Marketed by Amianthus, Ltd.

Designation	Description	Preparation
A	Over 1½ in.	Hand cobbing (crude)
B	¾ to 1½ in.	Hand cobbing (crude)
E	½ in. and upward	Hand selected and fiberized
F	¼ to ½ in.	Milled
G	⅛ to ¼ in.	Milled

In the eastern section of the Barberton district another asbestos-producing company uses a different system of grading as given below. Preparation for the market is by hand cobbing:

Grading Scheme of Munnik-Myburgh Asbestos, Ltd.

Designation	Description	Treatment
Extra IXL	Over 2 in.	Hand cobbed
IXL	Over ¾ in.	Hand cobbed and screened
XL or No. 1	½ to ¾ in.	Hand cobbed and screened
X or No. 2	¼ to ½ in.	Hand cobbed and screened
XX or No. 3	⅛ to ¼ in.	Hand bobbed and screened
Milling or No. 4	Less than ⅛ in.	

The Cape blue or crocidolite variety of asbestos has been worked longer than other grades. The oldest and most important producer is the Cape Asbestos Co. Grading, as with the other companies in the Union, depends chiefly upon the length of fiber. The Cape company mines its asbestos from deposits laid out regularly for underground development. The bulk of the crocidolite seams vary in length from one-half inch to an inch. The grading of the company follows:

Grading Scheme of Cape Asbestos Co.

Designation	Description	Treatment
X	Up to ¼ in.	
S	¼ to ½ in.	.....Machine graded
A	½ to ¾ in.	
B	¾ to 1¼ in.	
C	1¼ to 1½ in.	.....Hand graded
D	1½ to 2 in.	
E	Over 2 in.	

It may be noted from the accompanying tables that there is no uniformity of practice among the producers as to grades, and in that respect the situation parallels Quebec asbestos companies' practice.

Amosite is very long-fibered asbestos, and, according to Hall, difficulty was first found in marketing it. Market preparation consists of sieving and cobbing. Unlike other varieties of asbestos, amosite maintains a long length in the deposits in which it occurs. In the great majority of cases the fiber is between 4 and 7 in. long, and the entire output is easily maintained at that standard. The average length is about 6 in. For certain consumers the fiber has actually been cut into 1 in. lengths. Amosite is harsher to the touch than the Cape blue, but the fibers are as strong.

The Union of South Africa is the only producer of crocidolite, and almost unlimited supplies are available. Amosite also occurs only in the Union. This is not true of chrysotile, however, the producers of which have to compete with producers in Rhodesia. Owing to the proximity of the Barberton district producers to railroad and shipping port, they have an important advantage over the Rhodesian producer. South Africa is making a start at local production of manufactured asbestos products, but has to face strong competition from European manufacturers.

Aside from the higher grades of South African asbestos mentioned above, some lower-grade material, known as asbestic, has been produced in Northern Transvaal and worked up into boiler lagging and other products. Asbestic is a mass fiber hornblende.

In Zululand, tremolite, or silicate of lime, has been mined and used for the manufacture of bricks, steam packing, and other products. The fiber is pale greenish gray to whitish, and is of the slip-fiber variety.

Cost Data of Truck Haulage

Further data on the cost of truck haulage[1] has been kindly supplied by Lyman H. Brooks, Jr., manager of the Irma Mines, Cooke City, Mont., in the following communication:

"Cooke is 56 miles off the railroad, and haulage is by means of autotruck. All but 4 miles of the road is in the Yellowstone National Park, which is kept up by the government. The road has no steep grades, on the haul from Gardiner, the railroad point, to Cooke; a steady climb for the first 5 miles is encountered, and on the back haul a 4-mile hill is to be climbed.

"Two and a half ton trucks are used; the price for the one-way haul is $15 per ton and on two-way haul $12.50 per ton. One contractor operating a fleet of six or seven trucks does most of the hauling. The trucks are so geared that about seven hours are required to make the journey.

[1]See issues of March 21 and April 11.—EDITOR.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

REDUCTION of about 7,500,000 lb. per month will be effected in the world's copper production as a consequence of curtailment on the part of the Anaconda Copper Mining Co., at Butte, in Arizona, and in Chile.

The first shipments of gold ore from the new camp of Gilbert, in Nevada, have been made, and exploration and development are active.

Officials of the Bingo Gold Mines, of Manitoba, have made public the report of J. A. Dresser on their property.

At Philipsburg, Mont., the Trout Mining Co. has arranged to treat ore from the property of the Philipsburg Mining Co.

It is reported that the Argonaut Gold Mining Co. has purchased the Plymouth mine, at Plymouth, Calif., at a bargain price.

Exploration by the Canario Copper Co. at its property in Nacozari, Mexico, is proceeding rapidly.

The Consolidated Mining & Smelting Co. has resumed shipment of zinc concentrate to smelters in Belgium.

Enlargement of the Vipond mill in the Porcupine district, in Ontario, will be started at once.

Earnings of the McIntyre-Porcupine Co. for nine months ending March 31 were $1,335,358.

Citizens of Boulder, Colo., have a novel plan for grubstaking prospectors who will search for mines in Boulder County.

Boulder, Colo., Citizens Plan to Grubstake Prospectors

Company Organized to Supply Funds—Only $50 per Month per Man —May Finance Smelter

In an effort to revive metal mining in Boulder County, Colo., ten or more prospectors will be "grubstaked" during the coming summer by a group of business and professional men of the city of Boulder. The backers have organized a company in which shares will be sold to all who wish to aid the movement. The funds derived will be advanced to experienced searchers for ore, preferably those who are familiar with those occurring in the district.

The prospectors will be allowed from $50 upwards each per month. They will report discoveries to the organization, after which experienced mining men in the group will make an examination and decide whether development is warranted. Returns from claims thus worked will be divided between the discoverer and the grubstaking group.

The organization also may take steps toward securing some sort of a reduction plant, preferably a small smelter unit, to treat ores from properties in the county which have closed down because operations are unprofitable in the face of existing high shipment charges to the smelter at Leadville.

Boulder owes its existence to the discovery of gold at Gold Hill in 1859. Subsequently large deposits of silver were found back toward the main range. One silver property, the Caribou, was at one time the most spectacular mine of its kind in the country. In late years, however, mining operations in the county have been at low ebb. During the war there was a considerable flurry of activity in the production of tungsten, and the output reached approximately $5,000,000 annually during the peak production.

Anaconda Cuts Copper Production by 7,500,000 Lb.

CURRENT copper production by the Anaconda Copper Mining Co. and its subsidiary companies is to be cut by about 7,500,000 lb. per month, according to well founded reports. The old and new rates are probably about as follows:

	Millions of Pounds Old Rate	New Rate
Anaconda	22	19
Inspiration	8	6
Chile	20	17.5

This is manifestly a move to help the market, which has been dwindling gradually in recent months as a consequence in part of the high rate of production. So far no news of curtailment on the part of others has come to hand.

Sink Shaft at Charcas

The Duncan Mining & Smelting Co. is sinking a two-compartment shaft at its property in Charcas, Mexico. According to A. B. Callender, who is directing the work, a winze on the vein exposed some high-grade copper-silver ore. A crosscut will be run to tap this oreshoot. The property is at the south end of the mineralized zone, on which the Tiro General is situated.

Calumet & Hecla's Monthly Output to Be 8,000,000 Lb. Soon

Reclamation Plants Will Provide 2,500,000 Lb. of 6½c. Copper—Economies at Smelter

Improvements in progress at the smelting plant of Calumet & Hecla Consolidated, in the Michigan copper district, including the erection of a second melting furnace and installation of equipment for handling of mineral and refined product, will result in a reduction of smelting costs. The mineral of all the producing units will be treated in three large furnaces when the improvements are completed in the fall. Practically all of the smaller furnaces will be abandoned. The three furnaces will be operated with pulverized fuel, effecting a saving of 25 to 30 per cent in coal costs. The operation of the larger furnace units will require a smaller smelter force than that at present employed.

With the operation of its two reclamation plants, Calumet & Hecla Consolidated will obtain a yield of approximately 2,500,000 lb. of refined copper per month produced at a cost, exclusive of selling, of 6½c. per lb. The new plant on the Tamarack conglomerate sands will go into operation soon. Its capacity is not quite half that of the plant on the Calumet & Hecla sands. It should produce around 700,000 lb. per month and continue this rate twelve years or more.

Calumet & Hecla production will be brought up to 7,300,000 lb. per month, estimated, with the Tamarack plant in operation. Output, with that of Isle Royale, a subsidiary, included, will be approximately 8,000,000 lb.

Gilbert, newest gold camp in Nevada

Whether this town will grow to some size, or quietly fade away, will depend on the development of several promising gold veins

Curtail Output at Newport Iron Mine by 25 Per Cent

Work at the Newport mine, at Ironwood, Mich., operated by the Youngstown Sheet & Tube Co., has been curtailed by eliminating all overtime by miners. No new men are being hired, and forces are being gradually reduced through men quitting. The daily hoist has thus been reduced about 25 per cent. The Wakefield and Plymouth open-pit mines at Wakefield have started shipping, and present plans indicate each will forward about 600,000 tons this season.

Oatman United Mill Ready to Start

J. K. Turner, consulting engineer for the Oatman United Gold Mining Co., states that the company's new milling plant at Oatman, Ariz., should be regularly treating ore by May 1. The mill machinery is being tried out, the ore chutes in the mine are being emptied of caved material so as to serve intermediate levels above the 600, ore is being hoisted, and the electric mine locomotive has been placed in operation. Unforeseen delays have prevented the starting of the mill on the day originally designated, but from now on it is expected that regular production can be maintained.

Jib Consolidated Property Will Be Sold

The property of the Jib Consolidated Mining Company located at Basin, Mont., will be sold at public sale by C. F. Gross, who holds deeds of trust, on May 9, at the court house in Boulder, Mont. According to the notice recently posted the Jib Consolidated owes $263,463.69, being principal and interest on certain notes, and has made default therein.

The mine and mill are still operating, and it is thought the sale will not close down the property. Ore of good grade is being mined.

Steals Platinum Worth $6,000

Fifty-two platinum cylinder cathodes and sixty platinum wire spiral anodes were recently stolen from the Copper Queen smelter assay office at Douglas, Ariz. At the present market price of $120 an ounce the loss is approximately $6,000.

Gilbert, New Nevada Gold Camp, Ships Ten Tons of $84 Ore

Shacks, Assays, Town Lots, Optimism and Liquor Give Boom Flavor —Too Early for Predictions, but Outlook Is Good —One Company Would List on Curb

By Our Special Correspondent at Tonopah, Nev.

THE new gold district of Gilbert, 29 miles west of Tonopah, Nev., continues to exhibit all regular symptoms of a boom camp. It now boasts a population of several hundred. Recently an all-night barbecue and dance was well attended by local folks and visitors, and it has been reported that many who attended woke, as if from a several years' dream, to find that, in spite of all assertions to the contrary, the country was temporarily in the same state as if the Volstead Act never was. Of course, the next day was different. However, in addition to advertising, much regular work is being accomplished, and over a large area. Several small shipments of ore have been made, the most important being a 10-ton lot which ran $84 per ton, values being practically all in gold. The district is filled with optimism and possibilities.

Gilbert is about halfway on a line between Tonopah and Mina, and on the northerly slope of the Monte Cristo range. About 2½ miles to the south is the old Carrie silver-lead mine, which was a producer twenty years ago. Claims were located on the site of the new discovery a few years ago and later abandoned. Last October the Gilbert brothers started a rush when they shipped about 50 tons of ore carrying free gold from an open cut on the Last Hope claim, which returned $27 per ton. Since that date the town has sprung up. All lots of the first townsite subdivision have been sold, and transfers of lots on the main street are said to have been for over $500 for 50-ft. front. New discoveries have been made and numerous companies have been organized. Several are already developing their properties. Surveyors have been busy, and a good district map has already been published by F. M. Rapp.

At the Last Hope shaft a gasoline hoist, air compressor, ventilating fan and sundry mining equipment have been installed, and several other prospects are either equipped or have machinery on the way to the camp.

The country rock is a rhyolite. The main dike traverses the low hills in a north-south direction, and is a highly silicified area, in the rhyolite. The ore-bearing rock is locally called a "quartz breccia," which is not undescriptive. The dike outcrops boldly on the ridge of the hills. About 2,500 ft. south of the original discovery, a new discovery was made on the Black Mammoth No. 2 claim. Free gold is visible at various points in the outcrop. The most skeptical cannot fail to be impressed at the sight of free gold in rock protruding 5 to 20 ft. above the surrounding country.

East of the main dike, about 600 ft. on the Homestake ground, a new discovery of free gold was made, in a boulder protruding from the hill. This discovery led to intensive prospecting, and five veins, about parallel, have been opened up. These veins are up to 18 in. wide, and contain good values in gold. Many lessees are now at work, and considerable ore is being won from surface workings. It is expected that the ore so far recovered will assay from $50 to $100 per ton.

The Gilbert-Mammoth-Last Hope Mines Co. owns the original discovery on the Last Hope claim, and the ground including the discovery on the Mammoth. This company is well financed, and application for listing the stock on the New York Curb has been made. Surface work has been suspended, and a shaft and tunnel are being driven to prove these discoveries at depth. Machine drills are used for this work. The Gilbert Homestake Mining Co. owns the Homestake group, and has leased most of the ground, reserving a small block for company operation. A tunnel is being driven to crosscut the several veins discovered at the surface.

Mineralization is not confined to this immediate area. Discoveries have been reported from adjoining claims, and it is not improbable that other veins will be opened. Free gold is always an inspiration for the prospector to do real prospecting, and there has been a revival of real prospecting throughout all of Nevada since this new boom started.

Bingo Gold Mines Officials Send Reports to "Mining Journal-Press"

Alleged Ore Averaged $1.22 per Ton—Dresser Discusses Geology of Deposit in Herb Lake District, Manitoba

THE Bingo Gold Mines, Ltd., from its office at Winnipeg, Man., has sent the *Mining Journal-Press* copies of reports made on its property, in the Herb Lake district in Manitoba, by J. A. Reid and J. A. Dresser. The only comment is "which may be of interest to you. Please acknowledge receipt."

Joseph Myers, managing director of the Bingo company, has lately been having a preliminary hearing in Winnipeg on charges of fraud in connection with reports made public last summer regarding the value of the so-called ore in the mine.

On April 15, J. A. Dresser testified that no ore of commercial value had been exposed in the mine workings of the company.

On April 21, J. A. Reid testified that assays from samples taken from the mine by members of the staff did not show the true value of the ore. The samples taken by himself did not show a commercial value. His assay report showed an average of $1.69 per ton, while others gave an average of $24.31 per ton. He had figured out that 1.9 grains of gold added to a 5-lb. piece of rock would bring the value to $20 per ton. It would need about $64 worth of pure gold to bring the value of the samples to the amount shown in the early reports. The witness was subjected to a long cross-examination with the object of establishing the contention of the defense that Myers was compelled to rely on reports furnished him by competent mining men for the information he sent out. Mr. Reid agreed as to the competency of Dr. R. C. Wallace, Prof. J. S. De Lury, and an engineer named Fairchild, whose reports would induce confidence in the mine.

The report of Mr. Dresser dated Dec. 27, 1924, says in part:

"There were few surface features to be seen. The underground development, which was all examined, comprises a shaft 400 ft. deep, approximately 600 ft. of drifts on each of four levels, altogether 2,440 ft., and three crosscuts, which have a total length of 170 ft.

"The fourth level was sampled at intervals of 10 ft. On the other levels the interval was 20 ft. The sample cutting was done by four experienced samplers, all technically trained engineers and men of known reliability. They were C. A. Chisholm and G. R. Bradshaw, of South Porcupine, and R. A. Tachereau and R. C. Gegg, of Dome Mines, Ont. The assaying was done by T. S. Gilchrist, of the firm of J. T. Donald & Co., consulting chemists, Montreal, with some assistance from the samplers. A temporary laboratory was set up for the purpose in one of the mine buildings near the shaft. In all, 884 ft. of rock channels were cut and the material assayed in 305 samples. Besides these, several duplicate samples were taken and were assayed in order to check results in the vicinity of occurrences of visible gold. This work was done between Nov. 26 and Dec. 15, 1924.

"I regret to report that no commercial ore was found. Gold occurs in numerous places in the property, but was found in no place in quantity large enough to be profitably recovered. The value of your property, therefore, becomes that of a prospect from which the area already worked must be entirely excluded.

"The data of these conclusions are given in the following assay plan and record of sampling and assay results. [Here follow description of samples and assay values obtained.—EDITOR.]

"The vertical interval between successive levels is 100 ft. The total length of drifts on each level as shown by the measurement of the sample sections is lightly more than 600 ft. The average width and value per ton where sampled are as follows:

Level	Width, Inches	Value
First	55.7	$1.66
Second	56.7	1.15
Third	55.9	1.06
Fourth	57.8	1.00
Mean total	56.5	1.22

"Visible gold could not be separated in the analyses owing to the fineness of the particles in which it occurs. The *crosscuts* show no significant values save where they disclose small quartz veins. The only one of these that is worthy of note appears in crosscuts 203 and 204 at a distance of 22 ft. east of the footwall on the second level. Here a width of 7 in. gave values of $8 in the south crosscut, 204; and of $15.50 in the north crosscut, 203. The distance between these crosscuts is 200 ft. The *shaft* yields variable values, in places high, but does not show a useful quantity of ore.

"The Bingo workings have been made in a mass of acid volcanic rock, which is associated with altered sediments. All are surrounded by granite, which is intrusive in its relation to the inclosed rocks. The whole series is a part of the Pre-Cambrian complex of northern Canada.

"The acid volcanic rock is principally quartz-porphyry with rhyolitic phases, as far as could be judged in field examination. These rocks are highly siliceous and no quartz-free porphyry could be detected. A somewhat more basic rock, probably melaphyre, appears in drift 101, but there is no perceptible effect of its appearance.

"Several veins are reported to occur on the property, but all the work except in the crosscuts has been done on one. This main vein, which is shown on the plans as having a northerly course, actually strikes 18 deg. east of north, and dips northwest at an angle of slightly more than 75 deg. It consists of a shattered zone of the country rock which has been partially filled or replaced by quartz and is penetrated in many directions by veinlets and stringers of that mineral. The footwall is well defined, and the hanging wall can generally be plainly discerned. Evidence of movement between vein and walls is common. This zone is quite uniformly 5 ft. wide.

"The quartz varies in width from 2 or 3 in. to as many feet. In the wider parts of the vein, the quartz is white and granular in appearance. In narrower portions, it is frequently found clearly banded with cloudy varieties. Gold is visible in small amounts in a few places. It is exceedingly fine and in places is imbedded in tiny stringers of schist. On the whole, the gold was found in such finely divided form that it could not be separated from the rock for assaying. An average of twenty-eight measurements of the quartz of the vein on the fourth level gave a width of 10 in. and an average value of $1.55 per ton. The average value of all the rocks samples on this level is $1 per ton.

"Metallic minerals such as commonly accompany gold in veins of this class are rare. Arsenopyrite in scattered grains is the most abundant. Galena, pyrite, zinc blende, and chalcopyrite are to be seen in places. All such minerals combined scarcely exceed 1 per cent of the quartz. Tourmaline is reported, but I did not see any. Fuchsite appears in one place and biotite is common in one phase of the wall rock.

"The wall rock is of the acid volcanic type. The walls are essentially made up of quartz-porphyry or rhyolite, except for a basic schist, probably sheared melaphyre, which appears in the footwall of drift 101. Minute seams of quartz are abundant and appear in the crosscuts even at a distance of several feet from the vein. Favorable assays that have occasionally been obtained from the wall rock are probably due to the contents of these seams.

"The essential features of the vein are a small but well-defined fracture zone in acid volcanic rocks; partial filling of the fracture zone by quartz not accompanied by either carbonates or feldspathic minerals; very sparing impregnation, principally of the quartz, by sulphides of arsenic and iron, lead, zinc, and copper; and a gold content altogether insufficient to be of commercial value.

"Structurally, the fracture zone offers a favorable channel for the circulation of gold-bearing solutions which have evidently been present in some, though small, amount. If the smallness of the gold content is due to lack of a sufficient supply of that metal in these solutions, the property has no appreciable prospective value.

"On the other hand, if the scarcity of gold in the deposits was caused by unfavorable conditions of deposition, as lack of vein materials having the character of precipitants, the conditions are more favorable, and other veins on the property or even other parts of this vein where vein filling and wall rock may be of different character should be worth investigation.

"It is known that the Rex mine, half a mile distant, is actually producing gold, though the profit of the operation is not known. Other veins in the Bingo group have been found to yield significant values in a few places. Adjacent claims give similar reports, but with the lack of facilities for assaying these reports must await vertification."

Natomas Company to Continue Operation at Oroville

The Natomas Company of California will continue the operation of its Feather River No. 1 dredge in the Oroville district. New ground as well as dredger tailings will be worked. The dredging of old dredger tailings has been generally disappointing, except where the old dredges left bottom gravel, which was the case in some instances, as many of the old dredges were not equipped for deep dredging. C. H. Thurman will continue in charge of the Oroville operations of the company.

Universal Exploration Co. To Develop Prospects in Joplin-Miami District

The Universal Exploration Co., a subsidiary of the U. S. Steel Corporation, has been formed to carry on development work in the Joplin-Miami district. E. E. Ellis, of Birmingham, Ala., is president of the new company, and Floyd Weed is Joplin representative.

The U. S. Steel Corporation is investigating chances for producing those metals which it uses in its operations, but is not as yet producing. It used more than 60,000 tons of zinc in 1924, the greater part of it for galvanizing.

Chicago People Buy Little Mary

The property known as the Little Mary mine, comprising eighteen claims located in the Comobabi range west of Tucson and owned by W. H., A. J., and C. H. Stepp, is reported to have been sold to a Chicago syndicate for $150,000, of which $20,000 has been paid as first payment. The mine is a silver lead prospect and has been worked by the Stepp brothers for nine years, during which time $40,000 in shipping ore has been mined and shipped to the El Paso smelter.

Pete Smith Mine Bought by Calivada Mining Co.

The Calivada Mining Co., recently organized under the laws of Nevada, with a capitalization of $150,000 divided into 1,500,000 shares of 10c. par value, has purchased from Frank R. Spaulding, of Bishop; W. L. Skinner, of Lone Pine, and Paul Watterson and William Guest, of Keeler, the Pete Smith mine, situated about two miles south of the famous Cerro Gordo mine and four miles east of the leaching plant of the new Continental Development & Reduction Corporation. Thus far this year shipments from the Pete Smith mine to the smelters have totaled 165 tons of ore of an average value of $45 a ton in silver and lead.

The new company has enlarged the mine force and will, it is announced, materially increase its production rate as soon as the near-by leaching plant is ready to treat custom ores. On the 150 level, 4 ft. of ore averaging $70 a ton is being developed. Already 30 tons of this ore has been extracted and placed on the dump. Sinking in the main shaft has reached a depth of nearly 200 ft.

Consolidated Mining & Smelting Increased Plant and Production in 1924

Sullivan Mine Makes a Good Showing —Total Value of Output, $16,882,129

The nineteenth annual report of the Consolidated Mining & Smelting Co. of Canada states that during 1924 the capacity of the zinc plant was doubled and the capacity of the lead refinery brought up to 325 tons of refined lead per day.

Other substantial additions and improvements have been made at the smelter. Metallurgical efficiency as regards both lead and zinc has been increased, costs and losses have been reduced, and recovery has been improved.

Work at the Sullivan mine has been satisfactory; the output for the year was 988,376 tons of lead-zinc ore, 5,941 tons of lead ore, and 1,943 tons of pyrite, which last was used at the smelter for the manufacture of sulphuric acid. The mill yielded 132,656 tons of lead concentrate and 134,814 tons of zinc concentrate. For the first three months of the year there was a shortage of power, and during the remaining nine considerable trouble was caused by interruptions in and irregularity of the electric service. The East Kootenay Power Co., which supplies power to the mine and mill, recently has brought another power unit into service and has duplicated the high-tension line between the power plant and the mine and mill, so further trouble from this cause is not expected. A higher grade of zinc concentrate has been obtained without sacrificing recovery. At the company's Rossland mines, on the other hand, conditions have gone from bad to worse. No new ore has been found, and production was continued at a loss for some time, with the determination to give the properties a thorough trial before closing them. With the exception of exploration by diamond drilling, all work at the Rossland mines has been stopped. During the year, 135,502 tons of milling ore and 19,797 tons of smelting ore were mined and treated.

The wage rate paid during the year was $3.50 to miners and $3 to muckers, with a 50c. cost of living bonus and a metal bonus that averaged 87c. per day added. Employees with three years of continuous service to their credit were given one share of the company's stock if they were married and half a share if single, with the privilege of buying the other half at its par value or winning it by becoming married within this year.

The total metal output of the smelter was 26,976 oz. of gold, 4,074,044 oz. of silver, 1,382,750 lb. of copper, 161,400,769 lb. of lead, and 54,885,643 lb. of zinc, to which is added 37,312,181 lb. of zinc recovered from concentrate that the company shipped to foreign plants. The total value of the output is placed at $16,882,129. The foreign plants mentioned are the Great Falls reduction works of the Anaconda Copper Mining Co. and zinc smelters in Belgium, both of which received large shipments of zinc concentrate.

Placer Operations Started at Leonia, Idaho

Placer operations at the property of the Leonia Gold Mining Co. at Leonia, Idaho, were started recently, the water in Boulder Creek having raised sufficiently to warrant day and night washing of the gravel beds on the lower part of the property, with one hydraulic giant. Another pipe line is being laid for the operation of a second giant, with which washing will be started in a short time. This formerly was the Idaho Gold & Ruby Co.'s property.

Trout Mining Co. Expands Manganese Operations in Montana

The Trout Mining Co., of Philipsburg, Mont., has leased the mining property of the Philipsburg Mining Co., which recently lost its concentrator by fire. The Trout company will treat the ores from the leased mines as well as that which is produced in its own property in its new mill, and from present indications it is likely that at least one more unit will have to be added to take care of the increased tonnage. This company is producing a high-grade manganese for storage-battery manufacturers.

Yankee Girl Reported Sold

The Yankee Girl and Dundee mines, at Ymir, B. C., have been reported sold to the British American and Foreign Corporation for a consideration of $750,000. The mines were examined last season by British engineers. The Yankee Girl mine was largely owned by Texas residents. The ores of the two properties consist of gold-bearing veins carrying ore of the average value of $15 to $20 per ton. Considerable tonnage has been shipped to the smelters in past years.

Wenden Copper Co. Plans to Sink to 1,000-Ft. Level

The Wenden Copper Co., which is developing a prospect in the Cunningham Pass district of Yuma County, Ariz., will sink a two-compartment shaft to a depth of 1,000 ft. at which level lateral exploration will be started. At present drifting is confined to the 400 level, where showings have been sufficiently encouraging to cause the company to decide on the shaft work. Recently constructed buildings include a workman's club, a machine shop, a superintendent's residence, and several cabins. Road construction is being carried on jointly by the company and Yuma County.

Another property in the Yuma district which is soon to be actively explored is the Otsego. This has been purchased by New York interests, who contemplate deepening the shaft from its present depth of 100 ft. to the 500 level, at which point drifting will be started. About 800 ft. of drifting has been done on the 100 level by previous operators and a 100-ft. winze has been sunk near the shaft. The Otsego adjoins the Signal mine, which is at present being operated.

New Candelaria Treats 2,800 Tons of Ore in March

The New Candelaria Mines Co. is making a determined effort to operate at a profit in the old silver camp of Candelaria, in Nevada. During March the company milled 2,800 tons of ore which averaged 11.3 oz. silver per ton. Bullion production was 19,700 oz. of silver and 51 oz. of gold, a gross value of $14,000.

A portion of the ore has been mined in the newer sections now under development, and a part from old stope fills, ore from the latter source being roughly sorted by screening before going to the mill.

Premier Bonds 49 Group?

It is currently reported in Vancouver that the Premier Gold Mining Co. has taken a lease and bond of the Forty-nine group, at the head of the Salmon River, and 25 miles from Stewart, B. C., but confirmation is lacking. The group originally was owned by Samuel Silverman and associates, of New York, who formed the Forty-nine Gold Mining Co.

Some promising bodies of ore were opened at the surface in 1920, and about 500 ft. of tunneling and drifting was done. With the exception of a little underground work, which was done last year, the property has been idle since 1921. Difficulty of access has been the chief bar against exploitation.

Great Southern Makes Progress

The Great Southern Mining Co., with holdings near Wickenburg, Yavapai County, Ariz., is reported to be making most satisfactory progress in the development and equipment of its property. The installation of the new five-drill air compressor will soon be completed. George H. Reel is president of the company and Charles E. Nathorst is consulting engineer and general manager.

Ship 100 Tons Monthly From Estelle Mines Property

The three-compartment raise from the tunnel level of the Estelle Mines Corporation property, adjoining on the south the famous Cerro Gordo mine, 5 miles east of Keeler, Calif., is nearing a height of 600 ft. The management plans soon to extend crosscuts from the top of the raise to intersect orebodies of the Cerro Gordo vein system, which has already been opened up on the Estelle tunnel level proper, 2,000 ft. south, and at a depth of 1,400 ft. below the deepest workings in the Cerro Gordo mine.

Ore for current smelter shipments, averaging 100 tons monthly, is being extracted in development work on the 140 level above the 8,100-ft. tunnel. The tunnel being extended by W. W. Charles and associates, of Los Angeles, on their lease covering three claims of the Estelle property, now measures nearly 200 ft. It is to be advanced a total of 1,000 ft. and is designed to intersect the southern extensions of five ledges of the Cerro Gordo vein system, the fifth, known as the San Felipe, at a depth of more than 500 ft.

Argonaut Buys Plymouth Mine on Bargain Counter

THE Argonaut Gold Mining Co. of Jackson, Calif., is believed to have purchased the Plymouth mine, at Plymouth, Calif. The Plymouth mine was operated by the Plymouth Consolidated Gold Mines Co., Ltd., an English company, and was recently thrown into the hands of a receiver. The English stockholders refused to pay the indebtedness, and the sale of the property was negotiated, with the result that it was acquired by the Argonaut company on a bargain basis.

The Plymouth company recently completed a campaign of shaft sinking and lacked the finances to follow up this work. The Argonaut company has recently cut the vein on its 4,950 level.

Tod-Stambaugh Iron Mining Operations Cease

Recently the operation of the Dunwoody mine, located near Chisholm, Minn., was transferred from the Tod-Stambaugh Co. to Pickands, Mather & Co. by its owners, the Youngstown Sheet & Tube Co. and the Inland Steel Co. This mine is one of the heavy producers on the Mesabi range and is operated by both open-pit and underground methods, shipping close to 1,000,000 tons each year. Also, a reserve property, the Orwell mine, near Coleraine, Minn., is included in this transfer. With these changes completed the Tod-Stambaugh Co. passes into history as an operating company, as all of their properties have been now absorbed either by the M. A. Hanna Co. or Pickands, Mather & Co. J. S. Lutes, general manager of mines for the Tod-Stambaugh Co. for the last thirty years, will retire on May 1 and make his future home in California.

Most of the Mesabi range underground mines are now loading into cars from the shaft. In addition to shaft loading, the Philbin mine of the Oliver Iron Mining Co., the Webb mine of the Shenango Furnace Co., the Wade mine of the Cleveland Cliffs Iron Co., and the Sargeant mine of the Wisconsin Steel Co., are loading from stockpile. The several concentrating plants on the west end of the range are ready and will be in operation in a few days.

Tonopah Extension Production Temporarily Cut

Production from Tonopah, Nev., for the first fifteen days of April was about $30,000 short of normal, due to decreased output by the Tonopah Extension Co., caused by settling of some of the largest producing stopes. Mining conditions will be improved by May first, at about which time a hanging-wall crosscut will have reached the blind side of the caved area, and production will be increased. West drifts on the 2,250 and 2,375 levels still have some distance to go to reach the projected position of the big oreshoot, so that these levels cannot be drawn upon.

Treadwell-Yukon Cuts Vein on 600

The orebody of the Treadwell-Yukon Co., operating in the Mayo district, Yukon Territory, has been cut on the 600 level. The vein is of normal width, and the assays correspond with those obtained on higher levels. The deepest level before the 600 level struck the orebody was the 400 level. No drifting on the new level has yet been done.

The mill is being steadily operated at the rate of 120 tons per day. Concentrates and high-grade ore are being hauled to Mayo for shipment. Indications now point to an important mine being developed in the property of the Treadwell-Yukon Co.

Aerial Tramway for Alta District

J. P. Clays has been granted a certificate by the Public Utilities Commission of Utah permitting the construction of an aerial tramway or bucket line in Little Cottonwood Canyon. The tramway is for the purpose of carrying ores and merchandise between Alta and Wasatch, where the line will connect with the Denver & Rio Grande Western road.

The cost of construction of the tramway is estimated at $250,000. Rates on ores down the canyon will be $1.50 to $3 a ton, as against the present wagon haul costs of $2.50 to $4 per ton. It is expected that 150 tons a day will be transported from the mines of this district at this figure.

Venus Silver Opens New Ground

Ore assaying 228 oz. silver to the ton and carrying 3 per cent lead has been uncovered in the property of the Venus Silver Mines Co., in the Old Deer Trail district of Stevens County, Wash. The ore was disclosed by following the vein on the lowest level of the workings, the vein being 4½ ft. wide.

Mohawk Increasing Its Grade With Wolverine Down

Mohawk, in the Michigan copper district, is mining the richest rock in its career, the enhanced mineralization in No. 6 shaft more than offsetting a slight falling off in No. 4. Mass copper contributes better than 11 per cent of Mohawk's combined mineral and mass output. Mohawk, which recently closed its Wolverine mine, will do better without Wolverine than with it.

The refined-copper yield of all rock stamped last year was 21.65 lb. per ton. The low copper content of Wolverine rock brought down the recovery. Though the extraction from Mohawk rock was 24.03 lb. per ton stamped, including mass, Wolverine rock returned only 15.90 lb., including mass. An average total of 2,344 tons of rock daily was treated. Of this tonnage, Mohawk contributed an average of 1,664 and Wolverine, 680. Mohawk tonnage will now be increased to replace that from Wolverine, and the gain in recovery will be marked. No. 6 shaft produced 49 per cent of the tonnage last year; No. 4 shaft, 43 per cent; and No. 1, open only during the last four months of 1924, 8 per cent.

Motor Buses Displace Shift Trains for Mine Employees

THE Inspiration Stage Co. has placed in operation between Miami and Inspiration, Ariz., six motor buses, each capable of carrying thirty-five passengers. The new buses are used to carry Inspiration Copper Co. employees between their homes in Miami and their working places at Inspiration. The trains which have been operated by the Inspiration company for this purpose have been discontinued.

Canario Copper Co. Reaches 600 Ft. With Batamoti Shaft

George F. Shurtleff, chief engineer on the staff of the Canario Copper Co., operating near Nocozari, Sonora, Mexico, has notified eastern company officials that the big Batamoti shaft has reached its objective point—the 600-ft. level—and that as soon as guides and other shaft equipment is installed crosscuts will be run to the expected orebodies on that level.

Besides the work being done on the 600 level, the company has sundry betterment plans in contemplation, including the construction of the first 1,000-ton unit of the proposed milling plant, and the building of a branch railroad spur line to connect the mine and mill with the main line at Nacozari.

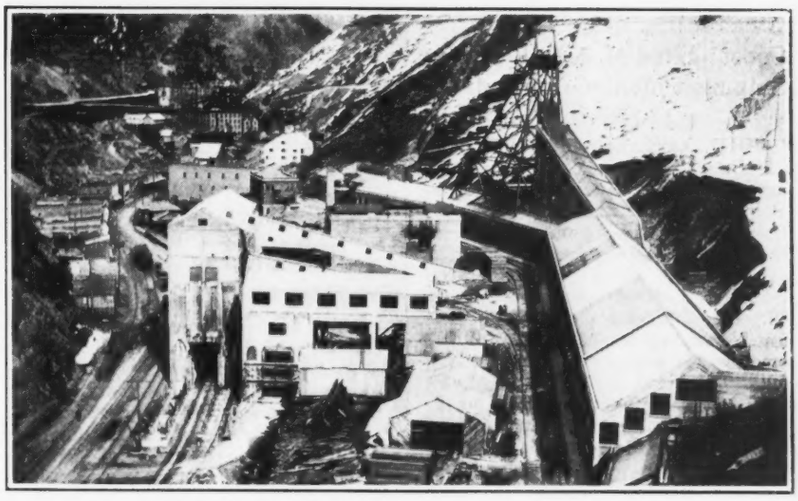
New Discoveries Reported at Jerome-Verde, in Arizona

Though no official announcement has been made, it is reported that two stringers of ore have been opened up in the southeast workings of the Jerome-Verde mine in the Jerome district in Arizona. The property is now owned and operated by the United Verde Extension Mining Co. One of these stringers is said to run well in gold and the other is reported to show good copper values. It is said that the gold bearing vein is better than a foot in width, and that the values are encouraging. The copper stringer is small, but of a quality that warrants the opinion that it may lead to an orebody of consequence.

Champion Mine Has New Pump

An electric pump of 2,400 gal. per minute capacity has been delivered at the Champion mine of the Copper Range Co., in the Michigan copper district, and will be immediately installed at the third level in No. 4 shaft. Two weeks will be required for installation. The pump will handle the excessive flow of water into the shaft, and the pump at the sixth level, now in use, will serve as an auxiliary.

At the Trimountain shaft, regular production has not been resumed, but a fairly heavy program of development work is in progress. No. 2 shaft is being sunk, and drifts are proceeding at depth. The ground in Trimountain is maintaining splendid values—the best in the history of this property.



Surface plant of the Hecla Mining Co., at Burke, Idaho, as finally completed

The tall concrete building over the railroad track houses the ore bins, with an elaborate sorting plant above, with conveyor belt leading from mine bins. The top floor of the concrete building in the center is occupied by the engineering staff; below are the electrical shops and the basement heating plant for all buildings requiring heat. In the long building beginning at the upper end are the compressor room, hoists, headframe, Hecla and Star ore bins, blacksmith shop, machine shop, supply warehouse, and carpenter shop. The dark building in background, left of center, is the company office. On the left is the main street of Burke. The four-story building in the background is the Tiger Hotel; covered trams and buildings in the distance are the Hercules mine. The concrete foundations over railroad track are for the Star loading bins.

Washington News

By Paul Wooton
Special Correspondent

Fluorspar Producers Want Help Under Flexible Traiff

Competition from Old Lead-Mine Dumps in Derbyshire, England—Big Producers Active

Domestic producers of fluorspar were in Washington last week in an attempt to convince the Tariff Commission that they should have relief under the flexible provisions of the tariff act. They pointed out that imports of fluorspar, which formerly were 5 per cent of the domestic production, now have risen to 40 per cent of the domestic production. They contend that they would be able to compete with the foreign producers, at least in Pittsburgh, were the duty increased by the 50 per cent allowed by the tariff act.

The present duty on fluorspar is $5.60 per gross ton, or ¼c. per pound. If the maximum tariff increase were allowed it would increase the duty by ¼c. per pound. This addition would add only 1c. to the cost of a ton of steel, it is pointed out, whereas it would make it possible for the domestic producers to undersell the British in Pittsburgh.

The British product comes from the old dumps at the lead mines in Derbyshire. Not only are the British spared the expense of mining, but they have in addition the advantage of a very low freight rate. The material moves in bulk as ballast.

All of the competition concerning which complaint is made comes from the British material. It is true that import figures show that only 60 per cent of our imports of fluorspar come from Great Britain, but this is explained by the fact that the remainder is made up of acid-grade fluorspar from the Transvaal. This does not affect the market, because those imports are almost entirely used in the manufacture of synthetic cryolite, to be used in the manufacture of aluminum.

No question of the quality of the material is involved. The steel manufacturers admit that the American fluorspar meets all requirements as to quality.

An unsuual feature of this complaint is the fact that it comes from the large producers. Some of the small producers have orders sufficient to cover their entire output. This is explained as being the outcome of the policy of the Steel Corporation in encouraging the development of new mines by placing its orders with the smaller producers. The effect of this policy is to develop greater resources, which can be drawn upon when it is profitable to do so.

War Minerals Relief

Awards of three war mineral relief claims amounting to a total of $2,512.09 have been made recently by the commission. The largest of the claims settled was to H. K. Welch, of Patagonia, Ariz., for losses in the production of manganese during the war. The amount given him was $1,366.69. The three settled claims have been certified to the Comptroller General for payment. The names of the claimants by States with the amounts awarded them follow:

H. K. Welch, Patagonia, Ariz., $1,366.69; covering losses in the production of manganese at property in Santa Cruz County.

V. V. Apperson, Willows, Calif., $975.10; covering losses in the production of manganese during the World War.

C. W. Youngman, New York, N. Y.,

Consolidated M. & S. Resumes Shipment of Zinc Concentrate to Belgium

THE Consolidated Mining & Smelting Co. of Canada is again shipping zinc concentrate to Belgium by way of the Panama Canal. The first consignment of the season went forward on the "Arkansas," which was billed to leave New Westminster on April 18. It is understood that from now until the extensions at the Trail smelter are completed the company will ship between 3,000 and 4,000 tons of zinc concentrate per month. The company also is shipping bar zinc heavily. More than 4,000 tons will leave New Westminster during the last two weeks of April. Representatives of Belgian zinc producers have been in British Columbia and in Idaho, and, it is understood, the present shipments are the result of negotiations made by them.

$170.30; covering losses in the mining of manganese during the World War at property near Batesville, Ark.

New Guggenheim Nitrate Plant Will Recover 95 Per Cent

To Produce One-eighth of Chilean Output—New Company Takes Over 100-Mile Railway

Fully a year and a half must elapse before the new Guggenheim process of treating nitrate of soda in Chile can be placed in operation on a commercial scale. While the new plant is being constructed, operations will continue in the plants of the Anglo-Chilean Nitrate & R.R. Co., the British concern which the Guggenheim interests acquired early this year. The company name has been changed and now is The Anglo-Chilean Consolidated Nitrate Co.

The Guggenheims were influenced to undertake this large operation, which will produce one-eighth of Chile's output of nitrate when the new plant will have been completed, by the promising prospects of the new process. This process, which has been under development for several years, is said to make possible recoveries as high as 95 per cent. In addition less power, labor, and water are required.

The properties taken over by the new company include the narrow-gage railroad, 100 miles long, connecting the plants with tidewater at Tocopilla. The Chile Exploration Co. operates a large plant at this port, which furnishes the power for its copper properties.

Though the new company is controlled by the Guggenheim brothers, no one of them is an officer of the company. Three of them are directors, however, and two are members of the executive board. E. A. Cappelen Smith, who has been closely associated with the development of the new process, is president. J. K. MacGowan and Paul H. Mayer are vice-presidents, and W. E. Bennett, secretary and treasurer.

Melbourne Letter

By Peter G. Tait

Special Correspondent

Broken Hill Companies Reach Three-Year Wage Agreement

Price of Lead to Govern—Gold Investigation Under Way—Shale Oil Plant Will Be Built

Melbourne, March 21—After considerable negotiations, the Broken Hill companies have been able to finalise a new wage agreement with the employees for a period of three years as from Jan. 1 last. The offer of the companies provides for the payment of a bonus on the price of lead starting at £30 per ton. The bonus will not operate over periods when, through strikes, shortages of water or coal, or other unavoidable causes, the production and treatment of ore of any company's mine are suspended completely, nor over any period in which the companies are prevented by cause beyond their control from smelting or shipping their products.

In an earlier letter reference was made to the appointment of a commissioner to advise the Western Australian government regarding the present position and future prospects of the gold-mining industry. The commissioner, C. Kinglsey Thomas, recently arrived from London to take up the work. He is reported to have been associated in a consulting capacity with one of the large South African mining groups. To assist him, H. M. Howe, superintendent of State Batteries, and W. Phœnix, Inspector of Mines at Kalgoorlie, have been appointed as advisers. The commission authorizes Mr. Thomas to investigate the conditions under which the mining industry is carried on and to make recommendations for the stimulation of the industry and the improvement of economic production. This will embrace a review of modern metallurgical methods and a report upon the advisability, or otherwise, of amalgamating adjacent properties with a view of milling operations being carried out on a larger scale. The question of ventilation and health of workers employed in mining operations will also receive attention.

The disappearance of the premium on gold is responsible for a revival of the suggestion that gold producers should receive a bonus on production. When it is remembered that the costs attendant on the industry show an increase of at least 50 per cent on pre-war figures, the need for some support is evident. The gold miner is not in what ex-Prime Minister Hughes termed the "vicious circle," which passes on the increased cost with a good margin for increased profit, and so the industry is decadent. If the industry is to be maintained in the face of the national policy of protection, a bonus on gold produced appears to be a feasible plan. The amount suggested is £1 per oz.

Several shipments of gold have recently been received from the United States. The "Sonoma" on her last trip brought shipments stated to be valued at $13,500,000.

The Australian Shale Oil Corporation has entered into an arrangement with the Tasmanian Government for the erection of a complete shale-treatment plant about two miles south of Latrobe, in the Mersey River Valley. The experimental Bronder retort is being installed, and tenders have been called for the first unit of the plant, which will cost about £30,000. It is interesting to record a statement by A. Macintosh Reid, the government geologist of Tasmania, who estimates that the actual and probable shale deposits in the Mersey valley total 37,000,000 tons. The oil content of the proved shale averages 40 gal. per ton and the seam varies from 4 to 6 ft. thick.

With the high prices now ruling for lead a number of the smaller silver lead mines throughout Australia are making good profits. One thing that hampers them is the lack of capital to install mining and other machinery. In many cases only high-grade ore is being shipped. The Zeehan field, on the west coast of Tasmania, is a case in point. It reached its zenith as a producer in the early 90's and has since been on the down grade. Today there is not a public company in the district mining ore, with the exception of the Electrolytic Zinc Co., which has erected a treatment plant and is raising a little ore from the Reid Rosebery group of mines. The mines today are either in the hands of tributors or are held by working parties of miners.

The high price ruling for antimony has given a much needed spurt to the operations at the Costerfield, Vic., antimony and gold mines worked by Antox, Ltd. The company is producing about 25 tons of concentrates per week assaying 60 dwt. antimony and 45 dwt. gold, and an arrangement has been made with the parent company, St. Helen's Smelting Co., of England, to take any surplus concentrates over and above Australian requirements. The company is supplying the whole of the antimony required in Australia, and is also meeting a good demand for refined oxide for paint manufacturers.

Alaska Juneau Elects

The following were elected officials of the Alaska Juneau Gold Mining Co.: F. W. Bradley, president, D. J. Murphy and A. B. Davis, vice-presidents; J. W. Crosby, secretary and treasurer; C. A. Norris, assistant secretary and treasurer. The following directors were re-elected: F. W. Bradley, D. J. Murphy, A. B. Davis, F. A. Hammersmith, C. A. Norris, Eugene Meyer, Jr., and S. W. Mudd.

The monthly report of the company for March, 1925, states that 285,500 tons was mined and trammed, yielding $173,700 or 60.84c. per ton, at a cost of $148,700, or 52.08c. per ton, resulting in an operating profit of $25,000, or 8.76c. per ton. Other expenditures for the month were: capital account $21,000; Ebner mining property, $2,000; interest on indebtedness, $15,750; total, $38.750; deficit, $13,750.

The additions to the milling plant are reported to be 38 per cent completed and preparatory work on the Ebner mine 39 per cent completed.

London Letter

By W. A. Doman
Special Correspondent

No Merger for Globe & Phoenix, Says Chairman

Railroad May Be Built to South African Platinum Fields—Soviet Representatives Say Little

London, April 14—At the meeting of the Globe & Phoenix Gold Mining Co., (Rhodesia), held last week, F. A. Macquisten, the chairman, denied the rumors that had been in circulation as to an amalgamation with neighboring properties. He stated that no suggestion of amalgamation had been received by the directors, and in his view no fusion could be entertained, seeing that the Globe & Phoenix had the plant and machinery and also a mine. Despite the fact that for years the ore reserves have decreased and are now at a low figure, Mr. Macquisten, with the optimism characteristic of all mining chairmen, stated that he saw "no prospect of the Globe & Phoenix coming to an end in the lifetime of the present generation of shareholders."

Though speculation is still active in Transvaal platinum shares, various authorities, technical and otherwise, are pointing out, through the medium of the press, the difficulties that will be encountered in extracting 2 or 3 dwt. of platinum from a ton of ore. It has further been shown that the price of platinum is not likely to remain at its present level if the reports as to the Transvaal deposits are correct. The Union of South Africa Government declares itself to be unopposed to capital invested in the mining industry, for it recognizes that capital is essential to the development of the country's minerals, but it is determined that the country is to share to a greater extent in the profits of the mineral production. A statement has been cabled from Johannesburg to the effect that the railway is to be extended from Steelpoort, near Lydenburg, to the center of the new platinum fields. The platinum finds, however, are not the reason for the extension of the railway, the object being to develop "huge deposits of chrome ore which are expected to rival those of New Caledonia." In some quarters the correctness of the message is questioned. Officially nothing is known.

The Russian Soviet Government has announced a new attitude toward private capital, which on investigation appears to mean that capital in the hands of private persons is not to be taxed more heavily than the funds invested in the co-operative societies. This is some concession, but apparently not much. In an interview with one of the London representatives of the Soviet Government, enquiring as to whether the attitude of that government towards the Russo-Asiatic Corporation had changed, the interviewer was informed that the matter could not be discussed.

As an indication of how metal mining is taxed, it may be mentioned that Viscount Milner at the annual meeting of the Rio Tinto Co. stated that of the company's total declared dividends—in round figures £1,018,000—the amount actually paid to the shareholders was £789,000, while £229,000 was retained for British income tax; and the profit for the year was only arrived at after paying Spanish taxes in excess of £250,000. Consequently, for the year the company staggered under a burden of £600,000 of taxation. In fact, it contributed nearly one-half of its earnings to the treasuries of Spain, Great Britain, and France.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Will Enlarge Vipond Mill to 300 Tons

Ankerite May Have Mill — McIntyre Earnings Increase—Keeley Will Sink New Shaft

Toronto, April 25—Officials of Vipond Consolidated Mines of Porcupine have announced that the capacity of the mill will be increased from 150 to 300 tons a day, and it is expected that the enlarged plant will be in operation by the end of the year. Preparations will be made immediately to continue sinking below the 1,000 level, which is necessitated by the results obtained from diamond drilling, indicating substantial values at greater depth. The company is producing approximately $50,000 a month from 5,000 tons, which is the highest-grade ore treated in the camp. Plans and specifications for the enlarged mill were completed some time ago, so that there should be no delay in starting the work.

$8 and $9 Ore Developed at Ankerite

F. R. Weeks, manager of the Porcupine Goldfields Development Co., is expected back from England soon, and on his return it is understood that preparations will be made to build a mill on the Ankerite property in Porcupine, which his company owns. Developments have shown substantial tonnage of ore averaging between $8 and $9, and diamond drilling has indicated another vein to the north, which shows higher values over greater widths. A crosscut is being driven to this vein from the 400 level, but is not expected to reach its objective for about two months.

The statement of the McIntyre mine for the nine months ending March 31 shows a gross recovery of $2,665,516 and operating earnings of $1,266,138; net earnings before taxes and depreciation were $1,335,358, compared with $1,146,350 in the corresponding period of the previous year. The net earnings, after deduction for taxes but before an allowance for depreciation, were at the rate of $2.10 a share a year, as against dividend requirements of $1. Profits are running at the rate of about 47 per cent of the recovery. The company has declared the regular quarterly dividend of 5 per cent payable June 1 to shareholders of record May 1.

The Keeley Silver Mines, of South Lorrain, proposes to sink a new shaft near the boundary between the Keeley and the Keeley Extension. This new shaft is necessary on account of the recent discoveries in this ground, where development has already proven considerable silver. Officials, however, consider the future possibilities of even more importance, as the vein system is very strong and bears a striking resemblance to the Woods vein. There are many branch veins, which are also very encouraging.

To finance the reopening of its property and the completion of its mill, the Goudreau Gold Mines is putting out an issue of $250,000 7½ per cent bonds. Officials believe that this amount will be sufficient to put the property on a profitable producing basis. So far $70,000 has been spent for mill construction, machinery, and equipment and almost $200,000 on mine development. A hydro-electric transmission line has been built and the company is assured an ample supply of power.

The bond prospectus states that the No. 1 vein has been stripped for 1,650 ft. and a 600-ft. section in the center averaged $24 a ton across 6 ft. Two shafts have been sunk, No. 1 to 400 ft. and No. 2 to 200 ft., and 1,000 ft. of drifting has been done from these shafts on the 200 level. Work from No. 2 shaft indicates 6 ft. of $24 to $28 ore, and the values in the drifts from No. 1 shaft are reported to be higher. Widths in places run up to 35 ft., and it is reported that on the 400 level, from No. 1 shaft, a crosscut shows 36 ft. of payable ore.

Batavia to Study Advisability of New Tin Smelter

The Government of Batavia has appointed a commission for the study of the proposal to establish a central smelter at Tandjong Priok, the port of Batavia, to reduce the alluvial tin recovered in the islands of Banka, Billiton, Singkep, and in the Malay States, according to consular advices to the U. S. Department of Commerce. The project is intended primarily to handle the tin from the government fields in Banka and Billiton, but it is thought that the probable cheapness of operation will induce the other producers in that part of the world to participate in the undertaking.

Banka and Billiton during 1923 produced 31,000 long tons of tin, or nearly as much as the Malay States.

Beautifying the Joplin-Miami District With Flowers

A MOVEMENT started in the Joplin-Miami district a few weeks ago, having for its object the planting of flower gardens at the mines, has been happily received and more than twenty companies have planted gardens.

The proposal to plant the gardens was made by Otto Shaner, a salesman for a Joplin foundry, and he carries with him in his trips over the district a large assortment of bulbs, seeds, and plants, and is always ready to take the time necessary to instruct a superintendent how to raise a garden.

Societies, Addresses, and Reports

Mineral Resources as Factor in World Affairs

Topic Will Be Discussed at Round-table Conference Conducted by C. K. Leith This Summer

Dr. C. K. Leith is to conduct a round-table conference on "Mineral Resources as a New Environmental Factor in World Affairs" at the fifth session of the Institute of Politics which is to be held at Williamstown, Mass., beginning July 23 and lasting for a month. The following syllabus of topics for discussion at the conference has been prepared by Dr. Leith:

1. Survey of growth of the mineral industry to a scale which makes it a new environmental factor in world affairs.

2. Sketch of geographic distribution of reserves of the principal minerals, bringing out the fact that each of the mineral industries is dominated by a few controlling centers of supply, the positions of which are fixed for the future.

3. The international movements of minerals consequent upon geographic distribution of reserves.

4. Political and commercial control of dominant reserves, and its present and future advantage to nations possessing it. Dominance of the United States and the British empire in this field.

5. Exploitation of reserves of backward nations and its relation to the principle of national self-determination.

6. Freedom of access to raw materials as a basic necessity for international peace.

7. The rôle of tariffs, embargoes, bonuses, and other regulative measures in international movements of minerals, and their relation to world peace.

8. Nationalization and internationalization of mineral resources. Pooling of exportable surplus of minerals as a war measure, and its possible peace uses.

The Institute of Politics hopes to gather together a number of geographers, geologists, engineers, and economists as well as diplomatic representatives of various countries to discuss these questions with a view to making an impartial survey of the facts and estimating the influence of the forces at work.

Further information as to this conference may be obtained by writing to the Institute of Politics, at Williamstown.

Chewelah Mining Bureau Formed

The Commercial Club of Chewelah, Wash., has created a department to be known as the Chewelah Mining Bureau. It will be under the supervision of a committee and its function will be to collect data regarding the mines in the vicinity of Chewelah so as to be able to furnish facts when asked for them. A blueprint of the district showing the location of all mineral properties has been prepared and will be sold at $1 per copy.

DeGolyer Elected President of Petroleum Geologists

The American Association of Petroleum Geologists held its tenth annual meeting at Wichita, Kan., recently. The major portion of the time was devoted to technical sessions, with one field trip to the Eldorado oil field.

At the first business session, E. De Golyer, of New York, was unanimously elected president. Other officers elected were: R. S. McFarland, vice-president; Dr. C. E. Decker, Norman, Okla., secretary and treasurer; Dr. R. C. Moore, Lawrence, Kan., editor of the *Bulletin*. The two last-named officers were re-elected.

Engineering Council Backing Jones Wyant Bill

To frame plans for eliminating waste in the administration of the public works functions of the U. S. Government, and to unify national reforestation effort, the administrative board of American Engineering Council, it is announced, will meet in Philadelphia on May 8 and 9. Engineers representing more than thirty local and national societies in all parts of the country are expected to attend, and it is expected that a campaign assuring nation-wide co-operation will be initiated.

"In this, the Council is adhering to the plan originating with Secretary Hoover, who as first president of the Council instituted the nation-wide engineering assay of waste which revealed heavy avoidable losses to industry," says the announcement. "The Council purposes to support the Jones-Wyant measure pending in Congress to reorganize the Department of the Interior with a view of accomplishing greater economies and efficiency.

"The Council's committee on government reorganization as it relates to engineering matters has devised a concrete proposal of departmental organization which, it is believed, meets the demands of sound public policy. This proposal will be publicly discussed at the meeting of the board to be held under the auspices of the Engineers Club of Philadelphia in May."

F. K. Copeland, of Chicago, it was announced, has been appointed chairman of the Council's Committee on Elimination of Waste in Industry.

Mineral Collections To Be Given Vancouver Schools

The British Columbia Chamber of Mines is assembling cabinets of British Columbia economic minerals, and these will be placed in the public schools of Vancouver and its suburbs. These cabinets are being made by the pupils at the Vancouver technical school. The work of the chamber has increased so much of late that it has been necessary to appoint an assistant secretary. J. F. Fraser, who has had some training in mineralogy, has received the appointment.

Research on Washington Ores Under Way at Pullman

State College Will Conduct Experiments on Lead and Zinc Sulphide Ores and Refractory Gold Ores

At present the State College of Washington has interesting work under way on some of the ores of northeastern Washington. In co-operation with the Dominion Silver Lead Co., a study is being made of its ore to determine, if possible, how the lead and zinc sulphide may be separated. The ore, as now shipped, contains about 147 oz. of silver, 15 per cent lead, and about 27 per cent zinc. This mine is rapidly developing its reserve and the separation of zinc and lead will be an important item in its development.

Work is also being done on the oxidized silver ore of the Deer Trail district. In the early days crude ores were shipped from this section and a large quantity of stope fillings and virgin low-grade ore is left, almost 50 miles from the railroad, which can be handled on the ground if suitable and efficient treatment processes can be devised.

A satisfactory process for treating the low-grade gold ores of the Republic district is also being sought. Past history of the district shows that this ore is difficult to treat and requires extremely fine grinding if the value is to be extracted economically. Success has been had in a general way in making a high-grade gold concentrate by flotation, and it is thought that a way of treating these ores that will involve grinding only to 48-mesh will be worked out. Details will not be available for some time because of the necessity of making a considerable number of corroborative tests.

California "High-grading" Bill, Signed by Governor, Becomes Law

The California high-grading bill has become a law by the signature of Governor Richardson. This legislation has had the support of mining men generally, as it has long been realized that a considerable proportion of the gold won in mining was being stolen and sold through the U. S. Mint and other channels.

The new law provides that every person, association, or corporation engaged in the business of purchasing, milling, sampling, or receiving ores bearing gold and silver in any form or precious metal bullion and amalgam must pay a license tax of $100 per annum and such person or association must be a bona fide resident of California. The law does not require mine operators or companies operating their own mills and producing gold and silver ores to take out a license. Applications for licenses must be made to the State Mineralogist and must be accompanied by a bond of $3,000. Licensees must keep a complete record of ores and bullion purchased, which record is to be open for inspection by the state mineralogist or his deputies. Failure to keep such records forfeits the license and incurs certain penalties, which it is expected will decrease materially dishonest and fraudulent practices.

Men You Should Know About

R. B. Lamb, of Toronto, is at Victoria, B. C.

W. H. Alderson has been appointed a director of the Beaver Consolidated Mines of Cobalt.

Frank J. Katz, of the U. S. Geological Survey, is in San Francisco on mineral resources work for the Survey.

Frederick W. Holler, general manager of the Matthiessen & Hegeler Zinc Co., spent the last week in New York City.

James S. Young, mining and metallurgical engineer, of Lima, Peru, has been in New York for the last few weeks.

Oliver E. Jager, metallurgical engineer, recently visited El Cobre, Provincia de Oriente, Cuba, on professional business.

Courtenay DeKalb has just completed an examination of the New Dominion mine, at Globe, Ariz., and will soon return to New York.

John W. Sherwin, general manager of the West End Consolidated Mining Co., at Tonopah, Nev., has been in Reno and Tonopah from Oakland.

E. V. Daveler, general manager, has been elected a director of the Butte & Superior Mining Co., to fill the place of **Charles Bocking,** resigned.

W. Y. Westervelt, of New York, is in Europe on a vacation trip of several months. It is to be hoped that he will return with his old-time vigor.

J. H. Stovel, of the E. J. Longyear Co., who is in charge of the company's operations in Caretta, W. Va., is visiting his family in Toronto, Canada.

L. L. Steindler, of New York, president of the Lorrain Consolidated Mines, of South Lorrain, in northern Ontario, recently made a visit of inspection to the mine.

E. H. Greer, mining engineer, has been placed in charge of development work at the Kirkland Central property in Lebel and Morrissette townships, in the Kirkland Lake area of northern Ontario.

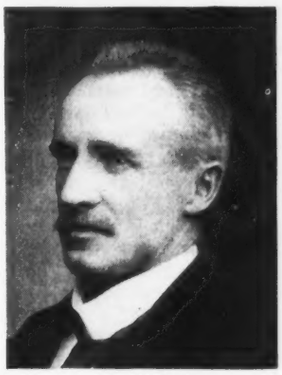
Robert A. Bryce, mining engineer of Toronto, is making an examination of the property of the Selkirk Gold Mining Co. of New York, situated to the west of the Long Lake gold district of Manitoba.

Colonel R. Waley Cohen, of London, director of the Royal Dutch Shell Co., and party, enroute from the Orient to England, made an inspection recently of the company's properties in Texas and Louisiana.

Thomas M. Owen, metallurgical engineer, of Wallace, Idaho, who recently retired as assistant general manager of the Federal Mining & Smelting Co., will leave in May for his former home in Sydney, Australia.

Prof. L. D. Huntoon has been engaged as consulting engineer by the Everett Mines, Ltd., and will supervise operations, which are soon to be resumed on the property, which is in the Gowganda mining district of northern Ontario.

Andrew Gibb Maitland, of Western Australia, has been awarded the Mueller memorial medal for eminent service in the cause of geology. He received his professional education as engineer and geologist at the Yorkshire college of science, England. From 1882 to 1896 he was assistant geologist on the Geological Survey of Queensland, Australia. In 1891 his services were placed temporarily at the disposal of the British Government for geological work and exploration in British New Guinea,



Andrew Gibb Maitland

and in 1896 he was appointed government geologist of Western Australia. In that capacity in 1908 he was mining representative for his state at the Franco-British Exhibition in London. Mr. Maitland is the author of many geological works and maps issued by the geological surveys of Queensland and Western Australia and by the government of British New Guinea; also of "The Extra-Australian Artesian Water Basin," published by the Royal Society of Queensland; "The Salient Geological Features of New Guinea," and "Recent Adventures in the Knowledge of the Geology of Western Australia." Mr. Maitland has also given valuable service to the Australasian Association for the Advancement of Science, of which institution he was president in 1907. The Mueller medal was awarded to him for his general work in geology, for a valuable monograph of his on the "Gold Fields of Western Australia," and for his important research into the question of artesian water.

Byron Wilson, mining engineer, of Wallace, Idaho, is now traveling salesman for the Coeur d'Alene Hardware & Foundry Co., manufacturers of mining machinery. Mr. Wilson recently left for Alaska in the interest of that company.

E. A. Cappelen Smith, president of the Anglo-Chilean Consolidated Nitrate Corporation, who recently was made a partner in the firm of Guggenheim Brothers, has just returned from Chile, where he made a tour of inspection of the company's properties.

G. Budden is now acting as superintendent of the Mina Duranguena at Estacion el Salado, San Luis Potosi, Mexico, and at two other small mines near by, for the International Ore & Smelting Co., a Belgian corporation buying zinc ores for shipment to Belgium and also operating its own properties in Mexico.

Charles A. Hamilton, a mining engineer widely known for his operations in the various mining districts around Oaxaca and elsewhere in Mexico, is convalescing from a severe attack of pneumonia which has had him confined to his bed for several weeks. He served his apprenticeship in the Comstock nearly sixty years ago, and has been connected with many important mining ventures.

J. H. Stanley, formerly assistant superintendent of the Burro Mountain concentrator, and recently shift foreman for the American Smelting & Refining Co. at Parral, Mexico, has been appointed superintendent of the Shattuck Arizona lead concentrator which is soon to resume operations at Bisbee. The concentrator will operate three shifts, but the crushing plant will run only every third day, which will be sufficient to keep the mill supplied.

F. H. Hayes, mine superintendent of the Copper Queen Branch of the Phelps Dodge Corporation, has announced the establishment of a new mining division at Bisbee, Ariz. The new division will be known as the Porphyry, and is a part of the Sacramento, which has been split into two parts, to allow closer supervision. The foreman of the new division will be **C. H. Lewis.** Lewis has been in charge of the company's leasing operations, and will be succeeded in that position by **C. O. Newton,** of the engineering department. **Clint W. Moon** is retiring from the position of safety inspector. He is one of the company's oldest employees. Moon began work for the company in 1889. He is at present state representative from legislative District No. 1. **Al. J. Morgan,** who has been appointed in Moon's place, has been with the company for fourteen years. He was made a shift boss about a year ago and has served as representative in the employees' congress. He is now representative in the state legislature from District No. 2.

Obituary

John Kiddie, mine superintendent of the Morenci branch of the Phelps-Dodge Corporation, died April 17 of injuries received in an accident at the Humboldt mine, at Morenci, Ariz. He was the victim of a fall of rock, which broke one of his legs and crushed the fourth and fifth ribs on his right side. He was one of the oldest employees in the Morenci district, having entered the employ of the old Arizona Copper Co. in 1906 as chemist. He was made mine superintendent several years later and was continued in this position when the Arizona Copper passed into the hands of the Phelps-Dodge Corporation. Mr. Kiddie was married in 1912 and leaves a wife and three children who live in California.

Recent Technical Publications

Reviews, Abstracts, and References

Metal Statistics. 1925. Eighteenth annual edition. Published by *The American Metal Market*, 11 Cliff St., New York. Price $1.

The metal trade is very familiar with this convenient reference book, which gives numerous data on production, consumption, prices, grades, and other pertinent matters. Both iron and the nonferrous metals are covered. The prices used are those of *The American Metal Market*, a daily New York metal paper. The statistics are attractively presented, and we have found them reliable and useful.

Tested Methods of Mineral Analysis. By B. T. Kitto. H. F. & G. Witherby, 326 High Holborn, London, W. C. 1, England. Price, 7s. 6d. International News Co., 83 Duane St., New York City, American agents.

This small book of 127 pages gives briefly detailed methods of analyzing ores for thirty-four different constituents. Naturally, there is little room for discussion of special methods necessary to be used when certain substances are present.

Giant Power. No. 207 of the Annals of the American Academy of Political and Social Science, Philadelphia. Price $2.

The development of electrical power to its *n*th degree is of vital moment to at least one miner—the copper producer. Hence the papers which have been written in this volume on the subject of super-power should be valuable to him in providing a résumé of the situation not only in the United States but in Europe as well. Throughout the work one reads of increasing applications of electric power in public utilities, on the farm, and in every-day life. Such a survey as made cannot but hearten the copper miner who is doubtful about the outlook for his product. The papers are short, well edited, and interesting, and will furnish any one interested an up-to-the-minute review of super-power in the United States.

Colorado Petroleum — The geology and oil and gas prospects of part of Moffat County, Colo., and southern Sweetwater County, Wyo., are discussed by Julian D. Sears in Bulletin 751-G of the U. S. Geological Survey, 50 pages, obtainable for 20c. from the Superintendent of Documents, Washington, D. C.

Nova Scotia Mining—The "Annual Report on the Mines, 1924," has recently been issued as a 351-page bulletin by the Department of Public Works and Mines, Halifax, N. S. Most of the mining in Nova Scotia is for coal.

Petroleum in Uganda—Memoir No. 1 of the Geological Survey of Uganda is by E. J. Wayland and describes the petroleum possibilities of that region. Several topographical maps and photographs are reproduced, the whole making a report of over 60 large pages. Obtainable for 5s. from the Geological Survey of Uganda, Entebbe, Uganda.

South African Mica and Corundum—A. L. Hall has a 7-page article in *The South African Journal of Industries* for December "On the Mica and Corundum Resources of the Union of South Africa." Names of principal producers are given. Pretoria; price 6d.

Screen Sizing—"A Proposed Standard Sizing Test," pp. 57, by John Gross, is an outline prepared for the consideration of the committee on milling methods of the American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City, from whom copies may presumably be obtained on request. This report is based upon numerous laboratory tests and the opinions of many mining engineers. A standard method of reporting screening tests in published articles is offered for general acceptance.

Mining Laws of India—Vol. 6, Part 1, of "The Mining Laws of the British Empire and of Foreign Countries," is devoted to British India, covering "General Principles and the Major Minerals." Price 15s. from The British Library of Information, 44 Whitehall St., New York City.

Gas Masks—"The Use of Carbon-monoxide Gas Masks in Mines" is discussed by S. H. Katz, G. S. McCaa, and A. L. Barth in Bulletin No. 14 of the coal-mining investigations of the U. S. Bureau of Mines and Carnegie Institute of Technology, 76 pages, obtainable for 40c. from The Carnegie Institute of Technology, Pittsburgh, Pa. Although essentially a coal-mine study, the principles set forth apply also to metal mines.

Transvaal Platinum — *The South African Journal of Industries* for February (Pretoria, price 6d.) contains a 22-page article by Percy A. Wagner on "The Platinum Deposits in the Western Part of the Lydenburg District, Transvaal." These deposits, though of lower grade than the Waterberg deposits discovered two or three years ago, are much more uniform and promise to be importance sources of world supply.

Iron Ore Analyses — Clement K. Quinn & Co. have issued their annual booklet giving 1925 analyses and guarantees on various grades of bessemer, non-bessemer, manganiferous, and siliceous ores. Copies are obtainable from the company at Duluth, Minn.

Metallurgical Accidents — U. S. Bureau of Mines Technical Paper 374, 31 pages, by William W. Adams, is a classification of "Accidents at Metallurgical Works in the United States During the Calendar Year 1923." Obtainable for 5c. from the Superintendent of Documents, Washington, D. C.

Keystone, S. D.—The mining activities of the regions around Keystone, S. D., are described in considerable detail in *The Black Hills Engineer* for January. (South Dakota School of Mines, Rapid City, S. D.; price 25c.) Arsenic, feldspar, and rare minerals are produced on a commercial scale, the Etta mine being famous as a storehouse of rare minerals and specimens.

Patents

Agglomerating Ore—No. 1,532,113. April 7, 1925. Nikolai Ahlmann, Copenhagen, Denmark. Pulverized ore is agglomerated by heating it to a temperature less than the sintering temperature, and then compressing it.

Rock Drills—No. 1,532,205. April 7, 1925. F. M. Slater, Easton, Pa., assignor to Ingersoll-Rand Co., Jersey City, N. J. A feeding mechanism for rock drills.

No. 1,532,468. April 7, 1925. Samuel Bawden, Oakland, Calif. A drill bit.

Petroleum Drilling — No. 1,532,311. April 7, 1925. J. H. Herman, Houston, Tex. A combined percussion and rotary drilling apparatus.

No. 1,532,623. April 7, 1925. J. J. Fitzpatrick, Tulsa, Okla. A pumping device for oil wells.

No. 1,532,979. April 7, 1925. R. C. Barbour, Corsicana, Tex. Fishing tool.

Aluminum Smelting — No. 1,531,528. March 31, 1925. D. H. Tilson, Badin, N. C., assignor to Aluminum Company of America, Pittsburgh. A method of gauging the thickness of superimposed metallic and non-metallic molten layers in an electrolytic cell.

Vanadium Recovery — No. 1,531,541. March 31, 1925. A. H. Carpenter, Sawpit, Colo., assignor to The Colorado Vanadium Corporation, New York City. Roasted vanadium ores containing calcium are leached with a dilute solution of a substance having a positive ion adapted to form a soluble compound with the vanadium acid ion, and having a negative ion adapted to form an insoluble compound with the calcium ion.

Hydrometallurgy of Copper — No. 1,533,741. April 14, 1925. F. O. Kichline and H. W. Sloyer, Lebanon, Pa., assignors to Bethlehem Steel Co. Ores are first treated with acid to obtain a rich copper-bearing solution, and the residue is washed with water to obtain a lean solution. The rich solution is then electrolyzed and a portion of the electrolyte withdrawn. The copper in the lean solution is precipitated with milk of lime, the precipitate being added to the withdrawn electrolyte, which is then electrolyzed again to deposit the copper. Sulphur dioxide is also used in the flow sheet.

Mine Car—No. 1,533,762. April 14, 1925. H. W. Sanford, Knoxville, Tenn. Arrangement of the wheels, axles, and frame of a mine car.

Rotary Kiln—No. 1,533,866. April 14, 1925. E. C. Kent, Brooklyn, N. Y., assignor to Robert Sayre Kent, Inc. A substantially air-tight rotary retort.

Magnesium—No. 1,533,911. April 14, 1925. W. G. Harvey, Niagara Falls, N. Y., assignor to American Magnesium Corporation, Niagara Falls. A method of electrodepositing magnesium from a molten fluoride bath, the zone of the bath around the cathode being kept at a lower temperature, and therefore more viscous, than the zone around the anode.

Ball-mill Lining—No. 1,534,000. April 14, 1925. R. H. Baker, New York, N. Y., assignor to Taylor-Wharton Iron & Steel Co., High Bridge, N.-J. A method of keying a lining in the shell of a ball mill.

New Machinery and Inventions

Eötvös Torsion Balance Improved

THE Eötvös gravity balance for the location of subterranean mineral deposit was originally designed as a visual reading instrument, the small torsional displacement of a mirror rigidly attached to the beam being observed by means of a telescope and scale as in the mirror galvanometer and similar instruments. Though this method of visual observation is well suited to a laboratory apparatus, it has several drawbacks in a field instrument —especially in one which is preferably operated at night. It entails the provision of long brackets to carry the telescopes, which necessitates the employment of a bulky protecting tent about 6½ ft. square in plan, and as this tent must be double-walled and strongly constructed, it weight is considerable, being four or five hundred pounds. Moreover, to read the instrument, the observer must enter the tent at frequent intervals, thus allowing currents of air to penetrate and disturb the instrument, in addition to the disturbance caused by his own approach. He must also stay awake during the night so as to obtain the necessary number of readings.

It was soon recognized that many, if not all, of these disadvantages could be eliminated by recording the displacement of the beam photographically, and various types of balances have been designed to effect this registration.

A new model has been designed by L. Oertling, Ltd., 88 Turnmill St., London, England, with the special object of reducing labor to a minimum, and enabling the instrument to register its movements photographically — though it can also be operated visually if required without opening the protecting tent in either case.

In the new design telescope arms are completely eliminated, the optical system being inclosed within the outer protecting wall which surrounds the upper torsion wires. The effective width of the instrument is thus reduced to less than 2 ft., and a special cylindrical metal tent of an internal diameter of only 2½ ft. has been designed to inclose the instrument completely, at the same time permitting all the necessary movements of recording to be performed.

The rotation of the upper part of the instrument into the various azimuths is effected by a clockwork mechanism controlled by an electric time-clock, which also controls the illumination of the scales at proper intervals for the photographic record.

If the instrument is to be used visually, the dark slide containing the photographic plate is replaced by a ground-glass screen, and the illumination and rotation are effected by the observer from without the tent, which is not opened except during the preliminary adjustment of the balance.

An important feature is the optical system whereby a magnified image of the actual scale is thrown upon the ground-glass screen for visual observation, or upon the sensitive plate for photographic recording. In all previous types of photographic balances the record merely consists of a spot of light of varying position, and the distance of this spot from the zero line must be subsequently measured. With such registration visual reading is extremely difficult, but in the present design it is simpler than in a telescope, as the image of the scale can be viewed from a distance—in fact from outside the tent.

With the improved optical system, owing first to the increased effective distance of the beam mirror from the scale (80 cm. compared with 60 cm. in the telescopic instrument) and second to the lens system which magnifies up to five times, the sensitivity of the reading is greatly increased and is variable at will. This permits the employment, if desired, of less sensitive torsion wires and thus eliminates much of the disturbing temperature and radiation effects.

With the additional protection against temperature and radiation effects arising from the provision of three metal walls to the instrument, and, if required, another three walls to the protecting metal tent—the spaces between all the walls being filled with thermally insulating material—it is claimed that in this new design, temperature and radiation effects are reduced to an absolute minimum consistent with economical transport. It is confidently anticipated that readings can be taken both by day and by night and at least three stations occupied every twenty-four hours; and, if desired, the instrument may be used visually by day and photographically by night. This will greatly reduce the cost of a survey with the balance, especially where the interval between stations is small, as in mining areas.

The instrument and tent are made as far as possible in a special non-corrosive aluminum alloy and are further protected by a coating of special paint. The total weight of the balance complete with battery and all accessories is approximately 140 lb. and of the tent about 200 lb.

If desired, the instrument can be clamped rigidly inside the tent, and the two transported on a light trolley to the next station—thus avoiding the delay of dismantling and re-erecting both instrument and tent.

Other special features of the new design are:

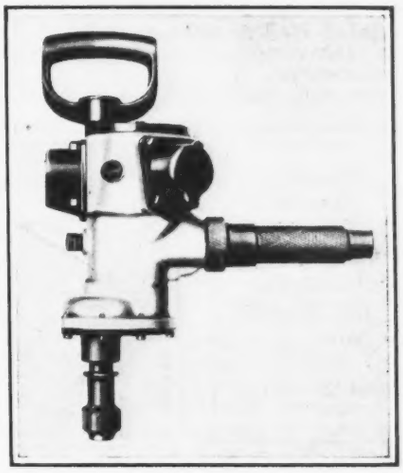
Small screws have been eliminated as far as possible, and quick-acting clamps substituted for them.

A drying agent has been introduced into the instrument to obviate the fogging of the optical surfaces. The lower tubes are detachable at will and the space and packing costs thereby reduced. A light alloy is used which is unaffected by sea water. The spaces between the walls of the instrument and of the tent are packed with special insulating materials to secure most adequate protection.

This Three-cylinder Drill Is for Wood Boring

A light-weight reversible pneumatic wood-boring machine in a new size has been brought out by the Ingersoll-Rand Company, 11 Broadway, New York. It is known as size DD and is suitable for wood boring up to 1 in. diameter holes. In construction it is similar to that of the other three-cylinder drills which this company makes. These drills have proved so successful that this new size was developed for wood-boring work.

The features of this type of machine are, briefly: A special three-cylinder motor; light-weight aluminum case, with steel bushings cast in place in all the bearing holes and the throttle hole; renewable crank-pin sleeve; and cast-iron cylinders which are renewable and



A light reversible pneumatic drill for wood boring up to 1-in. diameter holes

interchangeable. The renewable cylinders are a valuable feature, as any cylinder, after long service, may easily be replaced and the motor made as good as new at slight cost.

The three-cylinder motor has the rotating parts all accurately balanced, eliminating vibration and reducing wear and tear on the machine. Economy in air consumption and cost of maintenance is claimed. Every part is accessible for inspection.

These drills are furnished with a spade handle and bit chuck as standard. A breast plate or feed screw can be substituted in place of the grip handle when so desired and a drill chuck in place of the bit chuck, and the drill so made adaptable for a wide variety of work. The weight of the drill is 15 lb.

A Friction Clutch for Light Duty

The Lemley model F friction clutch has recently been introduced as a medium and light-duty clutch which can be conveniently applied to practically any machine or countershaft which requires a friction clutch. It has few parts, all of which are in plain view and readily accessible. No special tools are required to adjust it or to disassemble it completely. The principle of operation is said to be quite sim-

ple. Uniform pressure on friction surfaces is assured at all times. The two toggles are adjusted at the same time by means of one split ring nut. Free-floating friction rings are fibre or asbestos brake-lining material are used. Model F is furnished as sleeve clutches, cut-off couplings, or bolted to the arms of pulleys, sprockets, gears, or sheaves. The manufacturer is the W. A. Jones Foundry & Machine Co., 4401 West Roosevelt Road, Chicago.

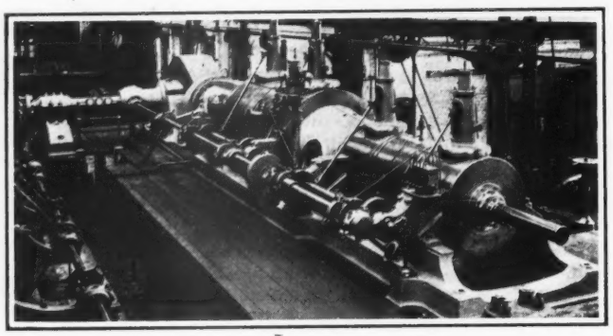
Largest Ventilating Plant in World Constructed

What is claimed to be the largest ventilating plant in the world has recently been completed for shipment to South Africa by Walker Bros., Ltd., of Wigan, England. This installation, comprising an "Indestructible" ventilating fan and a steam-driving engine, both of Walker make, is destined for the Government Gold Mining Areas, Johannesburg.

The fan, which is shown under construction in one of the accompanying photographs, is 30 ft. in diameter and has a capacity of 900,000 cu.ft. of air per minute against a water gage of 7½ in. The engine is a horizontal tandem compound engine fitted with forced lubrication to all bearings. It is shown above.

In general, the plant, it is said, is similar to the one recently supplied to the Great Western Railway Co. of Great Britain for ventilating the tunnel under the river Severn.

Horizontal tandem compound engine for ventilating fan, in shop before shipment to South Africa

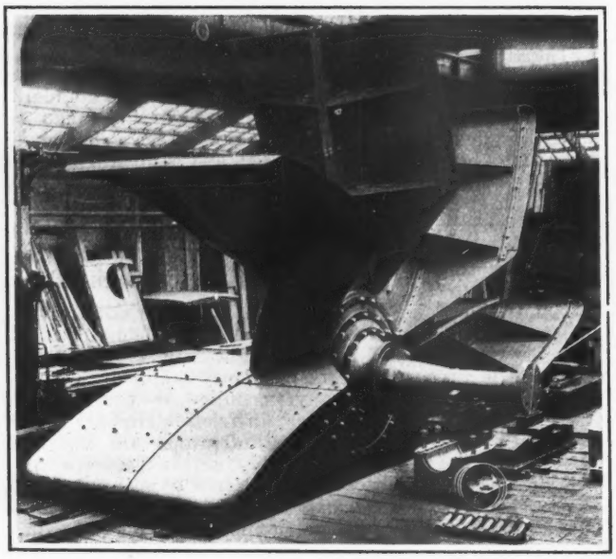


Starting Small D.-C. Motors for Portable Mine Pumps

The Lehigh Valley Coal Co. recently adopted a novel means of starting the small direct-current motors used for driving portable mine pumps. The customary practice of throwing these motors directly on the line usually causes much spitting and arcing at the brushes. To eliminate this, about fifteen protective panels, of the General Electric CR-3171-6 type, were purchased and rewired in the following manner:

One contactor is used to open and close the shunt field, the other to open and close the positive line to the motor. A snap switch is used to provide undervoltage release, which, when closed, completes the control circuit of the shunt field contactor. The interlock on this contactor completes the control circuit for the line contactor. The short time interval between the closing of the shunt field and the motor line by this method of wiring allows the shunt field to build up and eliminates most of the sparking when the motor is thrown on the line.

A resistor tube is connected across the contact tips of the shunt field contactor. This tube is shorted while the motor is running, but, when the motor stops, allows a small amount of current to flow through the shunt field, keeping the motor dry. The slight heating of the resistor tube prevents the accumulation of moisture inside the inclosing case when the motor is idle.



Ventilating fan for Government Gold Mining Areas, on the Rand, South Africa, in the manufacturer's shop in England. It is 30 ft. in diameter

New 20-Ton Gasoline Locomotive

Attractive lines in gasoline locomotive construction are seen in the new 20-ton model designed by the Davenport Locomotive Works, Davenport, Iowa. It has a long, slightly tapering hood, and an all-steel cab resting on a rugged, well-designed under-frame. There are no "hang-overs" from steam locomotive design. All working parts are inclosed and protected from dirt and the weather, but arrangement is such that inspection or adjustments can be made quickly and easily.

Roller-chain transmission has been adopted, as it reduces friction and wear to a minimum, gives higher mechanical efficiency, and furnishes a semi-elastic driving medium that protects the entire mechanism from shock. The four driving wheels have steel tires and are individually driven on four short axles of large diameter riding in Timken roller bearings which take both the side thrust and weight of the locomotive. This individual wheel drive gives remarkable tracking qualities, each wheel acting independently to hold the rail under all conditions.

This new model is equipped with self-starter, Westinghouse air brakes, and electric lighting for the headlight and cab. A six-cylinder Climax engine is used, and all parts are instantly accessible.

Trade Catalogs

Slate Larries—Marion slate larries are described in a 4-page folder recently issued by the Marion Machine, Foundry & Supply Co., Marion, Ind.

Rock Drills—The following catalogs have been received from the Sullivan Machinery Co., Chicago, Ill.:

Bulletin No. 81-E, covering the DW-64 water hammer drill; 16 pages, illustrated.

Bulletin No. 81-EA, "The Sullivan DW-64 Hammer Drill for Channeling or Line Drilling"; 4 pages, illustrated.

Bulletin No. 81-F, on "Rotator hammer drills, DP-331, DP-321, and DR-371; 32 pages, illustrated.

Bulletin No. 81-G, on air feed stoping drills, DU-48 rotating, and DT-44 light stoper; dry and water types; 20 pages, illustrated.

Shop Tools—Stocks and dies; water, gas, and steam-fitters' tools, and pipe-threading machines are covered in Catalog No. 19 of the Armstrong Manufacturing Co., Bridgeport, Conn.

Shovels — Molybdenum-steel shovels, spades, and scoops made by the Wood Shovel & Tool Co., Piqua, Ohio, are described in a new catalog just issued.

Diamond Drills—Sullivan Machinery Co., Chicago, Ill., has issued Bulletin 80-A, dated April, 1925, describing its "C" and "CN" mounted diamond drills for gas-engine drive.

Chain—A book describing Link-Belt rivetless chain, with illustrations has just been published by the Link-Belt Co. It portrays the assembly and dissembly of this chain, which has only three parts. The text includes tables of weights and strengths. Copies will be mailed free on request to the Link-Belt Co., Chicago, Philadelphia, or Indianapolis.

The Market Report

Daily Prices of Metals

Apr.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
23	13.125	52.75	53.625	7.75	7.40	6.90
24	13.25@13.375	53.375	54.125	7.75	7.50	6.95@7.00
25	13.40	53.75	54.50	7.75	7.50@7.60	7.00@7.025
27	13.40	53.625	54.50	7 775	7.60	6.95
28	13.40	54.25	55.25	7.775	7.60	6.90@6.95
29	13.40	55.00	56.00	7 775	7 60	6.95@7.00
Av.	13 340	53.792	54.667	7 763	7.542	6 956

*The prices correspond to the following quotations for copper delivered: April 23d, 13.50c.; 24th, 13.50@13.625c.; 25th, 27th, 28th and 29th, 13.65c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Apr.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
23	60 3/4	61 3/4	63 3/4	242	244 1/2	32 9/16	32 5/16	35 1/2	33 5/8
24	61 5/8	62 5/8	64 3/4	245 1/4	247 1/2	33 1/8	33 3/8	35 3/16	34 1/8
27	61 3/4	62 1/4	64 3/4	244	246 1/2	33 7/16	32 7/8	34 11/16	33 11/16
28	61 3/8	62 3/8	64 3/4	246 1/8	248 1/4	33 3/16	32 11/16	34 5/8	33 5/8
29	61 3/8	62 1/4	64 1/2	249 3/4	251 3/4	32 11/16	32 11/16	34 5/8	33 11/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Apr.	Sterling Exchange "Checks"	Silver		Gold London	Apr.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
23	4.79 3/4	66 1/2	31 3/16	85s 6d	27	4.81 5/8	66 3/4	31 1/8	85s 9d
24	4.80 5/8	66 1/2	31 1/16	86s 3d	28	4.82 3/4	67	31 1/4	86s 0d
25	4.81 1/8	66 5/8	31 1/8	....	29	4.83 5/8	67	31 1/16	84s11d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Prices Make Substantial Recoveries

New York, April 29, 1925—Copper, lead, and tin have taken a turn for the better. Prices have advanced in all three metals, with rather sharp increases in copper especially. The strength of these markets seems to be based mainly on improved business conditions abroad, although in lead the heavy volume of sales made to domestic consumers is, in itself, an explanation of the improved price of that metal. Great Britain's return to the gold standard is hailed with much satisfaction by the producers, and the election of Hindenburg in Germany was only momentarily disquieting.

Copper Market Higher and Firmer

April of this year will be noted for the relatively high ratio of export to domestic sales of copper. European consumers have long been known to have a propensity toward buying copper when prices are low. The month just ending is added evidence of that fact. Nearly all producers report doing a large amount of export business during April; some state it as being "highly satisfactory" and others as "record breaking." For all of them domestic sales have been slow at best. The rise in the price of copper last week can be attributed mainly to the heavy buying in Europe. Last Monday a large British cable manufacturer is reported to have bought 1,000 or 1,200 tons at between 13.875 and 13.925c. c.i.f. This heavy buying caused other consumers to make purchases abroad. Germany and England have been the most prominent buyers.

In the domestic market copper manufacturers have taken only moderate tonnages at prices reflecting the advance that took place in the London market. Early in the week sales were made at 13⅜ to 13½c., and on Saturday a fair amount brought 13⅝c. Since Monday prices have ranged between 13½c. and 13¾c. with a larger tonnage sold at 13⅝c. The announcement of production curtailment by some leading producers was very beneficial, and there are rumors that other producers may follow.

Heavy Buying Carries Lead Prices Up in West

The contract price for New York lead, set by the American Smelting & Refining Co., continues at 7.75c. per lb.

The reaction in the London lead market, with markedly higher prices on Wednesday, Thursday, and Friday of last week, led consumers in the United States to believe that the low point in the recent downward movement had been passed, and in the last week heavy tonnages have been bought. The demand has come from far and wide, all classes of consumers entering the market, principally for their May requirements. Few large individual sales have been made, most of the orders being for from 1 car to 300 tons. The large bulk of the business was done by one producer, though another sold liberally so far as his production admitted. Were it not for these free offerings at only slightly advanced prices, the market would almost certainly have advanced much more rapidly. Evidently, some of the producers are trying to stabilize the market at around current levels. Though sales have been large, no runaway market is anticipated, for plenty of lead is on hand to meet normal requirements, and no one has had to take less than he wanted, unless, possibly, he confined his inquiries to one producer. In some instances, requests have been made for shipment later than June, but by far the bulk of the business has been for prompt or May shipment.

Prices in the New York market have been more stable than those in the West, owing to the unchanged level of the leading interest. Some lead, however, has been sold for 7.80@7.85c. in New York and vicinity, for shipment from the West.

Monday was the only day in the week when business was at all dull; London declined a little that day, and an ill-advised quotation 15 points below the market was broadcast, so a large number of telegrams were required to straighten the matter out.

Zinc Market Lifeless

It has been an "off" week for zinc. Sales have been the lightest in volume in months. The only feature of note has been an increasing interest in the market by Europe, with a small amount of zinc sold abroad. Prices obtained have been better than in the domestic market, which ranged from 6.90 to 7.025c. Galvanizers have not been interested, and zinc has failed to share in the general improvement of other non-ferrous metals. High-grade continues to be sold for 8½ to 8¾c. per lb. delivered.

Correction—A misprint occurred in the quotation of April 17 as published in some of last week's copies. The incorrect quotation is 6.75@7.85c.; the correct one, 6.75@6.85c.

Tin Quiet at Higher Levels

Prices of tin are up about 5c. above the level of two weeks ago. Buying has been fairly good during the week, the advance apparently having no particular effect either way in volume of sales. Dealers have been in the market to cover May orders. Spot Straits is scarce, commanding premiums of ⅜@½c. over June shipment. Supplies of Chinese and 99 per cent are adequate, however, so that there is a greater differential between the prices of Straits and 99 than usual.

Sterling Close to Parity

The biggest news of the week, of course, was the re-establishment yesterday of Great Britain on the gold basis. Sterling should hereafter vary between $4.84 and $4.90, beyond which limits gold would be shipped. Other foreign exchanges were favorably affected by sterling's rise. Closing cable quotations on Tuesday, April 28, were: francs, 5.22c.; lire, 4.0975c.; and marks, 23.81c. Canadian dollars, ¼ per cent discount.

Silver Dull and Weak

During the past week the silver market has fluctuated within narrow limits, but the tendency has been toward slightly higher prices, due somewhat to the advance in sterling exchange. India remains a moderate though cautious buyer, and China has shown somewhat more interest in the market than has been the case recently. The spread between spot and forward has disappeared, and silver in the London market is now quoted the same for both deliveries.

Mexican Dollars—April 23d, 24th, 25th, 51¼c.; 27th, 51⅜c.; 28th and 29th, 51½c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £125.

Antimony—

Chinese brands, 11.25@11.50c. per lb.

Cookson's "C" grade 15¼c.

Chinese needle, lump, nominal, 10c.

Standard powdered needle, 200 mesh, 11½@13c.

White oxide, Chinese, 99 per cent Sb_2O_3, 16c. nominal.

Bismuth—$1.95 per lb., in ton lots. London, 7s. 6d.

Cadmium—60c. per lb. London, 2s. 2d.@2s. 6d.

Iridium—$375@$400 per oz. London £70.

Nickel—Ingot, 31c.; shot, 32c.; electrolytic, 38c.; London, £172½ per long ton.

Palladium—$79@$83 per oz. London £17.

Platinum—$118.50 per oz. refined. London, £25 per oz.

Crude, $114.50.

Quicksilver — $81@$82 per 75-lb. flask. San Francisco wires $81.35. Quiet. London £13½.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten,** and **Zirconium** are unchanged from the prices given in the April 4 issue.

Metallic Ores

Chrome Ore—$22.50@$23 per ton, c.i.f. Atlantic ports.

Iron Ore—Lake Superior ores, per long ton, Lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range, $4.55.

High phosphorus foundry, over 0.18 per cent P, $4.15.

Tungsten Ore—Per unit, N. Y.:

Chinese wolframite, $11.

High-grade Western scheelite, $11 nominal.

Galena Radio Crystals, Manganese, Molybdenum, Tantalum, and **Vanadium Ores** are unchanged from April 4 quotations.

Zinc Blende Higher; Lead Ore Lower

Joplin, Mo., April 25, 1925

Zinc Blende

	Per Ton
High	$53.50
Premium basis 60 per cent zinc	$50.00@$52.00
Prime Western, 60 per cent zinc	$47.50@$49.50
Fines and slimes	$47.00@$44.50
Average settling price, all	$50.22

Lead Ore

High	$106.60
Basis 80 per cent lead	$85.00
Average settling price, all	$96.05

Shipments for the week: Blende, 13,109; lead, 2,306 tons. Value, all ores the week, $880,890. Shipment four months: Blende, 264,002; calamine, 579; lead, 44,714 tons. Value, all ores four months, $19,599,570.

Some Prime Western grade ore was sold early this week on $47.50 basis, and some with high iron content sold today on $50 basis, with prices ranging between these extremes, $48.50 and $49.50 being common offerings today. Buyers had less than 10,000 tons bought ahead of shipment at the close of settlements last Saturday, against a usual tonnage of 20,000 to 25,000 bought ahead of shipment. The purchase this week was 15,000 tons, with the shipment only 13,000 tons.

Production has been lowered to around 14,000 tons per week, a decrease from the high level of about 3,000 tons per week.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Corundum, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and **Zircon** are unchanged from April 4 prices.

Mineral Products

Arsenious Oxide (white arsenic)—5½c. per lb. Good business done.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from April 4 prices.

Ferro-Alloys

Ferromanganese—Domestic, German, and English, $115 per gross ton, f.o.b. works, or duty paid at seaport.

Ferrosilicon—10 to 12 per cent, $34@$40 per gross ton, f.o.b. works.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrotitanium, Ferrotungsten, Ferrouranium and **Ferrovanadium** are unchanged from the prices given in the April 4 issue.

Metal Products

Zinc Sheets—10c. per lb.

Copper Sheets—Base price 21.75c. Wire, 15.875c.

Nickel Silver—18 per cent Grade A sheets, 28½c. per lb.

Yellow Metal — Dimension sheets, 19⅜c. per lb.; rods, 16⅜c.

Lead Sheets are unchanged from the issue of April 4.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick, and **Zirkite** are unchanged from April 4 prices.

Steel Market Quiet

Pittsburgh, April 28, 1925

A few months ago increased steel buying stiffened prices, and stiffening prices stimulated buying. Now the process is reversed. Decreasing mill operations weaken prices and weakening prices induce buyers to liquidate stocks and buy correspondingly less.

Substantial price declines have occurred in the last ten days in bars, shapes, wire products, and sheets, averaging $2 a ton and covering approximately half of the total steel products.

Pig Iron—The market remains stagnant. Foundry iron is off 50c. Bessemer, $21; basic and foundry $20, Valley.

Connellsville Coke—Market stagnant. Prices unchanged: spot furnace, $3@$3.15; spot foundry, $4@$4.50.

Company Reports

Butte & Superior Mining Co.

The statement of the operations of the Butte & Superior Mining Co. for 1924 shows that the net credit to surplus for that year amounted to $209,372.18, compared with a deficit of $31,050.86 for 1923.

The general manager's report calls attention to the decline, both in quantity and grade, of zinc ore reserves proven and prospective. The stated reserves are sufficient to support production at the present rate only a little beyond the end of 1925.

The status as regards copper ores is more satisfactory, in that existing reserves of commercial grade would support present rate of production to approximately the middle of the year 1926, and undoubtedly additional disclosures of copper ores will further extend the time stated.

The total zinc ore produced during the year amounted to 294,858 tons, containing a total and average metal content as follows:

	Gold, Oz.	Silver, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.
Total content...	1,158	1,113,247	1,353,291	9,107,991	58,499,014

The production of copper ore amounted to 167,312 tons, containing a total and average metal content as follows:

	Gold Oz.	Silver, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.
Total content....	713	1,059,760	13,797,257	1,378,361	9,726,163

Comparative Balance Sheet

Assets

	Dec. 31, 1924	Dec. 31, 1923
Property accounts	$5,856,907.84	$5,828,691.65
Investments	1,774,768.09	1,820,533.57
Current and working assets	2,131,490.99	1,688,860.30
Deferred charges	1,527.80	20,908.14
	$9,764,694.72	$9,358,993.66

Liabilities

Capital stock issued and outstanding	$2,901,977.00	$2,901,977.00
Current liabilities	201,697.24	82,171.13
Reserves		
Depreciation	$2,424,157.30	$2,244,157.30
Compensation insurance	$67,013.13	$64,147.74
Against book value of investments	$1,274,768.09	
Surplus from sale of securities	$2,176,868.05	$2,176,868.05
Surplus from operations	$718,213.91	$1,889,672.44
	$9,764,694.72	$9,358,993.66

Comparative Statement of Operations

	Year 1924	Year 1923
Operating revenue	$2,969,261.48	$3,346,294.30
Operating costs	$2,504,282.09	$3,032,553.10
Net income from operations	$464,979.39	$313,741.20
Other income	40,678.39	44,065.59
Total income	$505,657.78	$357,806.79
Charges against income		
Depreciation	$180,000.00	$219,412.09
Deferred development charges, shut-down expense and taxes	116,285.60	169,445.56
	$296,285.60	$388,857.65
Net income for year (without deduction for depletion)	$209,372.18	(a)$31,050.86

(a) Loss.

Surplus from Operations

Balance, Dec. 31, 1923	$1,889,672.44
Net income for year (without deduction for depletion)	209,372.18
	$2,099,044.62
Less adjustment of reserve	1,380,830.71
Balance of surplus, Dec. 31, 1924	$718,132.91

Alaska Juneau Gold Mining Co.

At the beginning of 1924 the mining and milling plants of the Alaska Juneau Gold Mining Co. had an average capacity of 7,430 tons per day and at the end of the year this capacity had been increased to 9,520 tons per day. This increase in capacity was secured by an expenditure of $232,162, which amount was obtained from operating profits; and before the end of the year 1925 it is expected to have all departments of the mining and milling plants co-ordinated up to a total over-all capacity of 14,000 tons per day, at a further expenditure of $300,000, which amount is also to be obtained from operating profits.

The latest increases in capacity have not reduced the average gold content of the ore sent to the mill; and consequently it is expected that increasing the plant capacity to 14,000 tons per day, with a further resulting decrease in milling costs per ton, will make the operating profits average about $100,000 per month, says the report.

The company's guaranteed note has been reduced to $50,000, leaving, with the bonds outstanding, a total secured and funded indebtedness of $1,944,000; and the additional indebtedness of unpresented bond coupons and open accounts payable exceeds the cash and other liquid assets by approximately $400,000.

Assay value of the ore mined in 1924 was $0.87 per ton in gold, of which $0.62 was recovered.

Balance Sheet, Dec. 31, 1924

Assets

Capital assets	$15,416,397.86
Current assets	465,178.91
Deferred charges	553,954.16
Deficit in surplus account	984,522.85
	$17,420,053.78

Liabilities

Capital stock	$14,000,000.00
Note payable—6 per cent guaranteed note	86,000.00
Funded debt	2,356,741.81
Unsecured loans and advances	360,755.86
Accounts payable and other liabilities	80,633.32
Depreciation reserve	535,922.79
	$17,420,053.78

Profit and Loss

Production (gross recovered values)		
Gold	$1,907,373.55	
Silver	42,501.72	
Lead	105,906.62	
		$2,055,781.89
Less operating and marketing costs		1,609,919.25
Gross operating profit		$445,862.64
Other income		3,404.79
		$449,267.43
Less interest charges		189,773.60
Net profit before depreciation		$259,493.83
Deduct main plant depreciation		169,213.48
Net profit before depletion to surplus account		$90,280.35
Deficit in surplus account Dec. 31, 1923		$1,074,803.20
Deficit in surplus account Dec. 31, 1924		$984,522.85

McIntyre Porcupine Mines, Ltd.

A statement of the quarterly earnings of the McIntyre Porcupine Mines, Ltd., for the nine months ending March 31, 1925, follows:

	First Quarter Sept. 30, 1924	Second Quarter Dec. 31, 1924	Third Quarter March 31, 1925	Nine Months Ended March 31, 1925
Gross recovery	$903,790	$885,570	$876,155	$2,665,516
Costs, including development	463,475	459,079	476,822	1,399,378
Operating earnings	$440,314	$426,490	$399,332	$1,266,138
Non-operating revenue	20,371	24,726	24,122	69,220
	$460,685	$451,217	$423,455	$1,335,358
Less provision for taxes for period	32,313	29,579	19,119	81,012
Net earnings before depreciation	$428,371	$421,637	$404,336	$1,254,345

Erupcion Mining Co.

Erupcion Mining Co. reports for 1924 that 30,289,377 lb. of lead was sold, of which 20,146,977 lb. paid duty and was sold in the United States, and 10,142,400 lb. was exported.

The cost of producing refined lead in bond at Perth Amboy, N. J., was 4.413c. per pound, including depreciation and depletion, but excluding United States income taxes.

The financial gain or profit made was $570,584.96. Regular quarterly dividends of 7½c. per share were paid during the year, and in addition a dividend of 5c. per share was paid for the first quarter, and 7½c. per share for each

of the last three quarters, so that the total amount of dividends paid during the year was 57½c. per share.

Production record follows:

	1916-21	1922	1923	1924
Dry tons ore shipped	7,577	25,627	70,777	68,022
Pounds refined lead returned	5,569,571	13,148,539	33,873,985	30,601,005
Per cent of refined lead returned per ton	36.76	25.65	23.93	22.50
Ounces silver paid for by smelter	63,115	126,321	388,833	371,602
Ounces silver paid for per ton	8.33	4.93	5.49	5.46

Mine development during the year has been satisfactory. In a number of cases the ore went much deeper along fissures cutting the manto [a layer or stratum] than was expected, and developments in Ahumada Lead Co. ground indicate that there may be important orebodies lying in territory west of the main manto, and there is a possibility that developments now being done in this territory may open up additional ore reserves of importance.

Balance Sheet, Dec. 31, 1924

Assets

Fixed		$1,385,607.14
Current		856,123.17
		$2,241,730.31

Liabilities

Capital stock		
Authorized—1,500,000 shares of $1 each		
Issued—1,250,000 shares		$1,250,000.00
Current		460,046.62
Reserves		
Depletion	$498,555.03	
Less portion of dividends Nos. 1, 6 and 7 applying thereto	157,455.59	
	$341,099.44	
Depreciation	34,427.25	
Mexican legal reserve	72,471.69	
		447,998.38
Surplus account		
Surplus Dec. 31, 1923	$198,308.55	
Net income year ended Dec. 31, 1924, per statement annexed	570,584.96	
	$768,893.51	
Deduct		
Dividends Nos. 4, 5, 6 and 7	$750,000.00	
Less portion applying to depletion reserve	98,028.99	
	$651,971.01	
Transferred to Mexican legal reserve	33,237.19	83,685.31
	$685,208.20	$2,241,730.31

Ahumada Lead Co.

Ahumada Lead Co. reports for 1924 that 21,330,262 lb. of lead was sold, of which 9,424,662 lb. paid duty and was sold in the United States, and 11,905,600 lb. was exported.

The cost of producing refined lead in bond at Perth Amboy, N. J., was 4.895c. per pound, including depreciation and depletion, but excluding United States income taxes.

The financial gain or profit made was $703,794.56. Regular quarterly dividends of 7½c. per share were paid during the year, and in addition a dividend of 2½c. per share was paid for the first quarter, and 7½c. per share for each of the last three quarters, so that the total amount of dividends paid during the year was 55c. per share.

Production for the year was as follows:

	1923	1924
Dry tons ore shipped	19,345	50,911
Pounds refined lead returned	9,680,299	20,596,797
Per cent of refined lead returned per ton	25.02	20.23
Ounces of silver paid for by smelter	120,277	279,950
Ounces of silver paid for per ton	6.22	5.50

Balance Sheet, Dec. 31, 1924

Assets

Fixed		$1,477,310.93
Current		625,418.46
		$2,102,729.39

Liabilities

Capital stock		
Authorized—1,300,000 shares of $1 each		
Issued—1,192,018 shares		$1,192,018.00
Current		531,586.54
Reserve		
Depletion	$100,361.17	
Depreciation	30,888.26	
Mexican legal reserve	30,593.56	
		161,842.99
Surplus account		
Surplus Dec. 31, 1923	$249,199.67	
Net income year ending Dec. 3, 1924	703,794.56	
	$952,994.23	
Deduct		
Transfer to Mexican legal reserve	$21,251.57	
Dividends	714,460.89	217,281.86
	$735,712.37	$2,102,729.39

Tintic Standard Mining Co.

Silver, Lead; Utah

The 1924 statement of the Tintic Standard Mining Co. shows lead production of 53,464,075 lb., compared with 40,589,030 lb. for 1923; silver, 4,205,463.27 oz., compared with 3,614,294.62 oz. for 1923.

Gross ore sales for the year amounted to $6,721,575.45. After paying smelter, freight, and treatment charges amounting to $1,969,458.68, net smelter returns totaling $4,752,116.77 were received. Mining costs aggregated $751,876.08; milling $666,667.85; state and county taxes $163,330.13, which left an operating income of $3,170,242.71. Overhead and general charges deducted from this amount were: general administrative expense, $71,449.79; depreciation of plant and equipment, $138,782.67.

Deduction of these two items from the operating income left a net operating income before allowance for depletion and federal taxes of $2,960,010.25, which was increased to $3,087,668.45 by $127,658.20 non-operating income.

Deduction of $522,537.33 for depletion and $312,798.38 for federal income taxes of 1924 left $2,252,332.74 net income to surplus.

Condensed Balance Sheet Follows:

Assets

Current assets	$3,181,537.90
Investments	1,091,068.69
Mining property (less depletion)	1,593,256.83
Plant and equipment, less reserve for depreciation	468,551.41
Total property	$2,061,808.24
Deferred assets	12,585.04
Deferred charges to operations	8,299.46
Total	$6,355,299.33

Liabilities

Current liabilities	$668,287.12
Outstanding capital stock—1,152,915 shares	1,152,915.00
Surplus	
Capital surplus arising from valuation of lode mining claims	3,005,906.15
Earned surplus	
Earned surplus, Jan. 1, 1924	392,516.23
Net profits for year 1924	2,252,332.74
	$2,644,848.97
Less dividends for 1924	1,320,620.00
Earned surplus unappropriated	$1,324,228.97
Surplus reserve for 1925 state and county taxes	203,962.09
Total earned surplus	$1,528,191.06
Total capital stock and surplus	$5,687,012.21
Total	$6,355,299.33

East Butte Copper Mining Co.

Balance Sheet, Dec. 31, 1924

Assets

Property	$3,369,897.61
United States bonds and certificates	390,000.00
Cash and metals	880,754.86
Accounts receivable	77,371.65
Equipment and supplies	232,522.86
Deferred charges	53,184.58
	$4,913,731.56

Liabilities

Capital stock	$4,248,870.00
Accounts payable	466,110.12
Contingent funds	92,982.66
Surplus	105,768.78
	$4,913,731.56

Statement of Operations

Number of tons ore mined—Pittsmont	74 044
Pounds of copper produced	7,140,220
Ounces silver produced	257,026
Ounces gold produced	519
Gross value metals shipped	$1,182,868.57
Other income	30,916.43
Gross income from all sources	1,213,785.00
Operating cost—Pittsmont	$1,280,014.46
Maintenance of properties	79,106.46
Total cost of operations	1,359,120.92
Loss on operations	$145,335.92
Depreciation	2,683.98
Outside exploration	13,372.87
Total deficit all operations	161,392.77

The East Butte Copper Mining Co. shows in 1924 a total loss of $161,392.77, which is traceable principally to metal prices considerably under pre-war prices, and to decreasing production of first-class ores.

Tennessee Copper & Chemical Corporation

The Tennessee Copper & Chemical Corporation's report for 1924 states that owing to continued improvement in the metallurgical practice and a better yield of copper per ton of ore treated, the production of copper for the year 1924 was 12,726,635 lb., compared with 12,013,988 lb. in 1923, and the cost was 1.76c. per pound lower than in 1923. The production of sulphuric acid was 247,477 tons, compared with 299,231 tons in the previous year. The average price received for copper was lower than in 1923, as was also the price of sulphuric acid. Owing to the prostration of the fertilizer industry during the first six months of the year, and the consequent lack of demand, the production of sulphuric acid in that period was only 91,736 tons, and all operations were curtailed accordingly. The operating profit from all sources for 1924 was $541,962.42, compared with $1,129,239.68 in 1923. This smaller profit is due largely to reduced acid production.

Consolidated Balance Sheet Dec. 31, 1924

Assets		
Capital assets	$13,985,030.91	
Less reserve for depreciation	2,694,027.21	$11,291,003.70
Investments:		
Tennessee Copper Co. first mortgage 6 per cent gold bonds	$1,000,000.00	
Southern Agricultural Chemical Corporation 10,000 shares @ $100 each	1,000,000.00	
Southern Agricultural Tank Line 10,000 shares @ $100 each	$1,000,000.00	
Other shares of stock owned	142,360.00	
		3,142,360.00
Current assets		4,711,396.67
Deferred charges:		
Prepaid insurance and d other expenses	$27,251.44	
Unamortized bond expense and organization expense	395 261.64	422,513.08
		$19.567 273.45
Liabilities		
Capital:		
Tennessee Copper & Chemical Corporation		$4,000,000.00
Tennessee Copper Co. shares		5,000,000.00
First-mortgage bonds issued		1,683,500.00
Southern Agricultural Chemical Corporation capital shares		1,000,000.00
First-mortgage notes		449,000.00
Southern Agricultural Tank Line:		
10,000 shares @ $100 each		1,000,000.00
Current liabilities		683,861.51
Deferred credit		80,376.05
Surplus:		
Capital surplus	$4,200,000.00	
Earned surplus	1,470,535.89	5,670,535.89
		$19,567,273.45

Facts for the Stockholder

American Smelting & Refining Co.

The American Smelting & Refining Co. was incorporated in New Jersey in April, 1899. It deals in ores, minerals, and metals, and manufactures and deals in the products thereof. Its products include gold, silver, copper, lead, zinc, sheet copper, test lead, sheet lead, pipe, mixed metals, nickel sulphate, sulphuric acid, arsenic, copper sulphate, zinc oxide, zinc dust, platinum, palladium, cadmium, thallium, bismuth, and selenium.

It owns the entire capital stock of the Consolidated Kansas City Smelting & Refining Co., United States Zinc Co., National Metallurgical Co., Federal Lead Co., Rosita Coal & Coke Co., and American Smelters Steamship Co. On Oct. 23, 1923, it sold to the St. Joseph Lead Co. all properties in Southeast Missouri owned by the Federal Lead Co. for about ten million dollars, approximately half of which was cash.

Smelting and refining plants owned by the company in the United States include lead-smelting plants at Leadville and Durango, Colo.; Murray, Utah; East Helena, Mont.; El Paso, Tex.; Federal, Ill.; Omaha, Neb.; Maurer, N. J., and San Francisco, Calif.; copper-smelting plants at Garfield, Utah; Tacoma, Wash.; El Paso, Tex.; and Hayden, Ariz.; copper refining and rolling at Baltimore, Md.; zinc-smelting plants at Amarillo, Tex., and Henryetta and Kusa, Okla.; a zinc-oxide plant at Pueblo, Colo.; a zinc-dust plant at San Springs, Okla.; arsenic refining, and the manufacture of cadmium, test lead and litharge at Denver, Colo.; lead refineries at Omaha, Neb.; Maurer, N. J., and San Francisco, Calif.; and lead manufacturing and gold and silver bullion refining at San Francisco.

In Mexico the company owns lead-smelting plants at Monterey and Chihuahua; a copper-smelting plant at Matehuala, San Luis Potosi; a copper-smelting and converting plant at Aguascalientes and San Luis Potosi; a copper- and lead-smelting plant at Asarco, Durango; and a zinc-smelting plant at Sabinas, Coahuila, all in Mexico. In Chile the company owns a copper-smelting plant at Carrizal, and a copper-smelting and converting plant at Caldera.

Important metal mines owned and operated by the company in Mexico are situated at Asientos, Ags.; Parral, Chih.; Bonanza, Zac.; Matehuala, S. L. P.; Sta. Eulalia, Chih.; Sierra Mojada, Coah.; Velardena, Dgo.; Sta. Barbara, Chih.; Charcas, S. L. P.; and in Peru, the company owns the Northern Peru Mining & Smelting Co., at Trujillo.

Mines owned in part, or leased and managed by the company, include the Yak properties at Leadville, Colo.; the Premier mine, at Stewart, British Columbia; the Angangueo Mines, at Angangueo, Mich., Mexico; the Parral Consolidated, Parral, Chih., Mexico; and the Towne mines.

The company owns and operates the following coal mines: Bon Carbo, Cokedale, Colo.; Cokedale mines, Cokedale, Colo.; Fairfax mines, Fairfax, Wash.; Rosita mines, Sabinas, Coah., Mexico; and the San Juan mines, Durango, Colo.

The company's products during the year 1924 included: 1,868,407 oz. of gold, 92,229,349 oz. of silver, 412,416 tons of lead, 522,472 tons of copper, 39,450 tons of zinc, 486 tons of tin, 1,998 oz. of palladium and platinum, 35,259 tons of sulphuric acid, 10,473 tons of arsenic, and 20,146,769 lb. byproduct metals. During the year the company mined 1,551,259 tons of ore, 501,779 tons of coal, and produced 206,189 tons of coke. It used 447,710 tons of coal, 486,459 tons of coke, 2,046,663 bbl. of fuel oil, and 4,257,998,000 cu.ft. of gas, smelted 5,160,236 tons of charge, and refined 898,390 tons of bullion. It employed 25,765 men.

Capital stock consists of 500,000 shares preferred 7 per cent cumulative, par $100, and 609,980 issued shares common, par $100. Funded debt consists of first-mortgage gold bonds, due April 1, 1947, Series "A" 5s. dated April 1, 1917, $40,529,100 outstanding; and Series "B" 6s. due April 1, 1947, $9,571,000 outstanding. Interest is payable April 1 and Oct. 1. The amount of bonds is limited to not more than the amount of full-paid preferred and common stock of the company. The bonds are redeemable on thirty days' notice, Series "A" at par and interest on Oct. 1, 1930, or on any interest date thereafter; Series "B" on any interest date on or before April 1, 1932, at 107½; thereafter at a premium of ¼ per cent for each six months between redemption date and date of maturity. The sinking fund starting Jan. 1, 1918, is 1½ per cent annually of the maximum amount of bonds issued. Sinking fund moneys applicable to Series "A" bonds shall be applied to purchase of Series "A" bonds at not over 105 and interest. Sinking fund moneys applicable to Series "B" bonds shall be applied to purchase of Series "B" bonds at not over 110 and interest. The bonds are a direct obligation of the company, and secured by a first mortgage on all its property by pledge of stocks of subsidiary companies.

Net earnings on preferred stock during the last ten years have been as follows: $18.54 in 1914, $28.80 in 1915, $46.50 in 1916, $40.16 in 1917, $17.39 in 1918, $12.09 in 1919, $14.32 in 1920, $3.42 in 1921, $11.84 in 1922, $17.85 in 1923, $22.22 in 1924. Net earnings on the common stock have been: $6.51 in 1914, $16.80 in 1915, $31.78 in 1916, $24.14 in 1917, $7.29 in 1918, $2.95 in 1919, $4.81 in 1920, deficit in 1921, $3.28 in 1922, $8.84 in 1923, $12.61 in 1924.

On Dec. 31, 1924, current assets amounted to $88,556,217, and current liabilities were $19,546,925, indicating net working capital of $69,009,292.

Dividends have been at the rate of 7 per cent per annum on the preferred stock since 1899, and on the common stock as follows: 5 per cent in 1904, 5½ in 1905, 7 in 1906, 7½ in 1907, 5 in 1908, 4 in 1909-11, 4¾ in 1912, 4 in 1913-15, 5½ in 1916; 7 in 1917, 6 in 1918, 4 in 1919, 4 in 1920, 1 in 1921, passed in 1922, 2½ in 1923 (resumed Aug. 1), 5 per cent in 1924, raised to 6 per cent Jan. 6, 1925. The directors stated that the company's showing during 1924, together with good business prospects for 1925, justified an increase in the common dividend. The company's cash position was greatly improved during 1924.

The price range of the preferred stock during the last ten years has been as follows: High 118½ in 1916, low 63¼ in 1921, closing price April 28, 1925, 106¾. The price range of the common stock in the same period has been: High 122⅞ in 1916, low 29¼ in 1920, closing price April 28, 1925, 97⅞.

INVESTIGATOR.

Mining Stocks

Week Ended April 25, 1925

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	36⅜	35½	36⅜	Ap.16, My.23,	0.75
Arcadian Consol.	Boston	1 7/16	1 5/16	1 7/16		
Ariz. Com'l.	Boston	10⅛	9½	10¼	Ja. 19, Ja. 31	0.50
Calaveras	N. Y. Curb			1⅛		
Calumet & Arizona	New York	47¼	45	46½	Mh.6, Mh.28 Q	0.50
Calumet & Hecla	Boston	13¼	12⅛	13¼	Ja.30, Mh.4	0.50
Canario Copper	N. Y. Curb	3⅛	3⅛	3⅛		
Cerro de Pasco	New York	46⅛	45	46	Ap.23 My.1, Q	1.00
Chile Copper	New York	32⅛	31⅛	32⅛	Mh.3,Mh.20, Q	0.62½
Chino	New York	20	19	20	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	3	2⅛	2⅛		
Copper Range	Boston	22⅛	20⅛	22⅛	Ap.9, My.4	1.00
Crystal Copper	Boston Curb	*64	*59	*62		
East Butte	Boston	3⅛	3⅛	3⅛	Dec., 1919	0.50
First National	Boston Curb	*18	*18	*18	Feb., 1919	0.15
Franklin	Boston	*95	*50	*50		
Granby Consol.	New York	14½	13½	14	May, 1919	1.25
Greene-Cananea	New York	12⅝	12	12	Nov., 1920	0.50
Hancock	Boston			*75		
HoweSound,new,r.t.c.	N. Y. Curb	16½	16½	16½	April, 1924	0.05
Inspiration Consl.	New York	24	22⅛	23⅛	De.20, Ja.7, Q	0.50
Iron Cap	Boston Curb	1⅛	1⅛	1⅛	May, 1923	0.15
Isle Royale	Boston	12⅛	9⅛	11⅛	Sept., 1923	0.50
Jerome Verde Dev.	N. Y. Curb	1⅛	1⅛	1⅛		
Kennecott	New York	48	46⅛	47⅛	Mh.6, Ap.1, Q	0.75
Lake Copper	Boston	1¼	1	1		
Magma Copper	New York	39¼	38	39¼	Jn. 15, Jy. 15,	0.75
Mason Valley	N. Y. Curb	1⅛	1⅛	1⅛		
Mass Consolidated	Boston	*58	*58	*58	Nov., 1917	1.00
Miami Copper	New York	10⅛	9⅛	9⅞	My.1 My.15 Q	0.25
Mohawk	Boston	29	28½	29	My. 2, Jn. 2	1.00
Mother Lode Coal.	New York	7	6⅞	7	De. 12, De. 31	0.37½
Nevada Consol.	New York	13⅜	12⅛	12⅛	Sept., 1920	0.25
New Cornelia	Boston	19⅜	18⅜	19⅜	My. 8, My. 25Q	0.25
North Butte	Boston	1⅛	1⅛	1⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*90	*80	*80	No.14, De.2	0.05
Old Dominion	Boston	19⅛	18⅛	19	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†110	†105		Mh 20, Ap.2 Q	1.00
Quincy	Boston	22	19⅛	22	Mar., 1920	1.00
Ray Consolidated	New York	12⅛	11⅛	12⅛	Dec., 1920	0.25
Ray Hercules	N. Y. Curb			14		
St. Mary's Min. Ld.	Boston	32	28⅛	32	Ap. 20, My.20,	3.00
Seneca Copper	New York			⅛		
Shannon	Boston	*65	*65	*65	Nov., 1917	0.25
Shattuck Arizona	New York	5⅛	5⅛	5⅛	Jan., 1920	0.25
Superior & Boston	Boston	1	*99	*99		
Tenn. C. & C.	New York	9⅛	9⅛	9	De.31, Ja.15,Q	0.25
United Verde Ex.	N. Y. Curb	24	20⅛	23	Ap. 3, Ap. 15	1.00
Utah Copper	New York	84	83⅛	83⅛	Mh.20,Mh.31,Q	1.00
Utah Metal & T.	Boston	*55	*52	*55	Dec., 1917	0.30
Victoria	Boston			*35		
Walker Mining	Salt Lake	2.72½	2.52½	2.52½		
NICKEL-COPPER						
Internat. Nickel	New York	30⅛	27⅞	30⅛	March, 1919	0.50
Internat. Nickel pfd.	New York			97½	Ap.16, My.1, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	5⅛	5⅛	5⅛		
Gladstone M. M. Co.	Spokane	*20½	*20	*20	Ap. 1925	0.00½
National Lead	New York	145½	139	140	Mh.13,Mh.31,Q	2.00
National Lead pfd.	New York	116½	116	116½	My.22, Jn.15 Q	1.75
St. Joseph Lead	New York	47½	45½	46⅛	Mh. 5, Mh. 20	0.50
ZINC						
Am. Z. L. & S.	New York	8	7⅞	7⅞	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	27⅞	26	26	Nov., 1920	1.50
Butte C. & Z.	New York	5⅞	5⅛	5⅛	De.10, De.24	0.50
Butte & Superior	New York	11⅞	10⅛	10⅛	Mh.19, Mh.31	0.50
Callahan Zn-Ld.	New York	3	2⅞	2⅞	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	186	183	183½	Ap.20, My.9	2.00
United Zinc	N. Y. Curb			*35		
Yellow Pine	Los Angeles	*70½	*68½	*70¼	De.10,De.15 Q	0.04
SILVER						
Alvarado	Boston Curb			2	Oct. 1920	0.50
Beaver Consol.	Toronto	*34½	*31	*34	May, 1920	0.03
Castle-Trethewey	Toronto	*80½	*79	*80		
Coniagas	Toronto	1.56	1.30	1.55	May, 1924	0.12½
Keeley	Toronto	1.97	1.95	1.96	Mh.1, Mh.15SA	0.12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Ap.1, Ap.15, Q	0.12½
La Rose	Toronto	*49½	*47	*48½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	1.12	1.11	1.11	Ap. 15, 25	0.05
McKinley-Dar.-Sav.	Toronto	*38½	*32½	*37½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.69	2.66	2.67	Sept., 1919	0.12½
Nipissing	N. Y. Curb	5⅛	5⅛	5⅛	Mh.31, Ap.21	0.15
Ontario Silver	New York	6	6	6	Jan., 1919	0.50
Temiskaming	Toronto	*18	*18	*18	Jan., 1920	0.40
GOLD						
Alaska Juneau	New York	1⅞	1⅞	1⅞		
Argonaut	Toronto	*34½	*33½	*34½		
Carson Hill	Boston	*30	*30	*30		
Consol. W. Dome L.	Toronto	*14⅞	*14½	*14½		
Cresson Consol. G.	N. Y. Curb	3⅜	3⅜	3⅜	Mh.31, Ap.10 Q	0.10
Crown Reserve	Toronto	*39	*37	*38½	Jan. 1917	0.05
Dome Mines	New York	13⅜	13⅛	13⅜	Mh.31,Ap.20,Q	0.50
Golden Cycle	Colo. Springs	1.44	1.44	1.44	Dec.11, 1924	0.03
Hollinger Consol.	Toronto	14.20	14.10	14.10	My.4.My.20,M	0.05
Homestake Mining	New York	44	43½	44	Ap.20 Ap.25 M	0.50
Jib, Consd	N.Y. Curb			*7		
Kirkland Lake	Toronto	*47	*43	*45½		
Lake Shore	Toronto	5.65	5.50	5.64	Mh.2, Mh.16,	0.05
McIntyre-Porcupine	New York	17	16⅜	16⅞	My.1, Jn.1,	0.25
Newray	Toronto	*22½	*21½	*22		
Night Hawk Pen.	Toronto	*25	*20	*24		
Portland	Colo. Springs	*48	*48	*48	Oct., 1920	0.01
Rand Mines	New York	37½	35½	37½	Fe.17, Fe.25	1.79
Teck-Hughes	Toronto	1.43	1.38	1.42		
Tom Reed	Los Angeles	*70	*63	*65	Dec., 1919	0.02
Tough-Oakes	Toronto	*31½	*30	*31		
United Eastern	N. Y. Curb	*51	*50	*50	July, 1924	0.05
Vipond Cons.	Toronto	1.19	1.18	1.18		
Wright-Hargreaves	Toronto	4.40	4.30	4.35	Mh.16,Ap.1,QX	0.05

Stock	Exch.	High	Low	Last		Last Div.
GOLD AND SILVER						
Black Oak	N. Y. Curb			*81		
Con. Cortez	N. Y. Curb			*10		
Con. Virginia	San Francisco	*6½	*5½	*5½		
Continental Mines	N. Y. Curb			1⅛		
Dolores Esperanza	N. Y. Curb			*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2 7/16	2⅜	2⅜	Mh.23, Ap.3,	0.08
Tonopah Belmont	N. Y. Curb	*57	*55	*55	Mh.15, Ap.1	0.05
Tonopah Divide	N. Y. Curb			*21	Se. 22, Oc. 10	0.10
Tonopah Extension	N. Y. Curb	2⅛	2 1/16	2⅛	Mh.11, Ap.1, Q	0.05
Tonopah Mining	N. Y. Curb	2 1/16	1⅞	2⅛	Mh.31, Ap. 21,	0.07½
Unity Gold	N. Y. Curb	*50	*50	*50		
West End Consol.	N. Y. Curb			*26	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*35	June, 1918	0.02
SILVER-LEAD						
Ahumada	New York	11	9½	10	Mh.16, Ap.2,X	0.25
Bingham Mines	Boston	32⅜	30⅛	31⅛	Mh.20, Mh.31	0.50
Cardiff M. & M.	Salt Lake			1.25	De.16, No.18	0.10
Chief Consol.	Salt Lake			4.00	Ap. 10, My. 1	0.10
Columbus Rexall	Salt Lake	*17	*16	*17	Aug., 1923	0.05
Erupcion	Boston Curb	2⅛	2 1/16	2 1/16	Mh.16, Ap.2, X	0.20
Federal M. & S.	New York	16⅛	16⅛	16⅛	Fe.26. Mh.15 Q	1.75
Federal M. & S. pfd.	New York	54⅛	51⅛	54	No.25, De.15,	1.75
Florence Silver	Spokane	*2⅛	*2⅛	*2⅛	Apr., 1919, QX	0.01
Hecla Mining	N. Y. Curb	15	12⅛	14	Fe.15, Mh.15	0.50
Iron Blossom Con.	Salt Lake			*36½	Oc.25, 1924	0.01½
Iron King Mining	Salt Lake	*60	*57	*59		
Keystone Mining	Salt Lake	*67	*63	*64		
Mammoth Mining	Salt Lake	2.45	2.32½	2.45		
Marsh Mines	N. Y. Curb			*5	June, 1921	0.02½
Park City	Salt Lakej	4.75	4.75	4.75	Mh.14, Ap.1	0.15
Park Utah	Salt Lake	4.00	3.75	3.95	April, 1924	0.15
Prince Consol.	Salt Lake	*29	*23	*23		
Silver King Coal	Salt Lake	6.40	6.35	6.40	Mh.20,Ap.1, Q	0.20
Silversmith	Spokane	*22	*19	*22	Ap.1, Ap.10	0.01
Tamarack-Custer	Spokane	*77	*74	*75	Se. 22, Se. 29	0.25
Tintic Standard	Salt Lake	9.25	9.05	9.25	Mh.23, Mh.30	0.40
Utah-Apex	Boston	6⅛	6⅛	6⅛	Ap.5, Ap.15,	0.35
Western Utah Copper	N. Y. Curb	*15	*15	*15		
IRON						
Bethlehem Steel	New York	41⅜	40	40½	Jn.1, Jy.1, Q	1.25
Char. Iron	Detroit	*20	*20	*20		
Char. Iron pfd.	Detroit	*85	*85	*85		
Colorado Fuel & Iron	New York	36	32½	35	May, 1921	0.75
Gt. North'n Iron Ore	New York	28⅛	27⅛	27⅞	Ap.11, Ap.30	1.00
Inland Steel	New York	40⅛	39¾	40	Fe.14, Mh.20 Q	0.625
Mesabi Iron	N. Y. Curb	2¾	2⅛	2⅛		
Replogle Steel	New York	15	13¼	13¼		
Republic I. & S.	New York	45½	43¼	43¼	May, 1921	1.50
Republic I. & S. pfd.	New York	86	86	86	Mh.8, Ap.1, Q	1.75
Sloss-Sheffield S. & I.	New York	85	82	82½	Mh.10, Mh.20Q	1.50
Sloss-Shef. S.&I. pfd.	New York	92½	92½	92½	Mh.20, Ap.2, Q	1.75
U. S. Steel	New York	118⅛	113⅛	115	Fe.28,Mh 30,QX	1.75
U. S. Steel pfd.	New York	123⅜	122⅞	123⅛	Fe.1, Fe.27, Q	1.75
Virginia I. C. & C.	New York	35	35	35	De.15, Ja.2	1.50
Virginia I.C.&C.pfd.	New York			75	De. 13, Ja. 2, Q	2.50
VANADIUM						
Vanadium Corp.	New York	27⅛	26¼	27	Jan., 1921	1.00
ASBESTOS						
Asbestos Corp.	Montreal	60	59	59	Fe. 1, Fe. 15 Q	2.00
Asbestos Corp., pfd.	Montreal	91⅜	91	91⅛	Ap. 1, Ap. 15, Q	1.50
SULPHUR						
Freeport Texas	New York	11⅞	9⅞	11⅛	Nov., 1919	1.00
Texas Gulf	New York	110	104½	105¼	Mh.2, Mh.14,	1.75
DIAMONDS						
De Beers Consol.	New York	20⅜	20⅛	20⅜	Ja.6, Fe.2	0.95
PLATINUM						
So. Am. Gold & P.	N. Y. Curb			2⅛		
MINING, SMELTING AND REFINING						
Amer. Metal	New York	46⅛	45⅞	46	Fe.18, Mh.2 Q	0.75
Amer. Metal pfd.	New York	113	113	113	Fe.19, Mh.2, Q	1.75
Amer. Sm. & Ref.	New York	94⅛	91⅛	92⅛	Ap.13, My.1, Q	1.50
Amer.Sm.&Ref.pfd.	New York	107⅛	106⅛	106⅛	My.8, Jn.1 Q	1.75
Consol. M. & S.	Montreal	70	67¼	69⅛	De.11, Ja.15 SA	0.75
Federated Metals	N Y. Curb			37⅛		
Southwest Metals	N. Y. Curb			*80		
U. S. Sm. R. & M.	New York	34	33	34	Ap.6, Ap.15	0.75
U.S. Sm. R.&M.pfd.	New York	44⅜	44⅛	44⅛	April, 1925	0.87½

* Cents per share. † Bid or asked. Q. Quarterly. SA. Semi-annually. M. Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.: Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange.

LONDON QUOTATIONS, WEEK ENDED APRIL 11

	H.	L.	Last	Date	Per Cent
Aramayo Mines	76/3	76/3	76/3	Feb. 1924	5
British Platinum	9/—	8/1½	8/9	Feb. 1925	2½
Bwana M'Kubwa	5/10½	5/6	5/9		
Camp Bird	2/11½	2/6	2/10½		
El Oro	6/9	6/3	6/9	Nov. 1924	2½*
Esperanza	—/11½	—/11½	—/11½		
Frontino & Bolivia	18/—	18/—	18/—	1923–4	10
Mexican Corporation	13/6	13/3	13/6		
Mexico Mines of El Oro	69/4½	66/10½	68/9	Dec. 1924	25*
Nechi (pref. 10s.)	2/6	2/6	2/6	1921–22	25
Oroville Dredging	7/—	6/7½	7/—	Dec. 1923	3½
Ouro Preto	10/6	10/6	10/6	Oct. 1924	5
St. John del Rey	17/9	17/3	17/9	Dec. 1924	3½
San Francisco Mines	23/6	23/—	23/6	Jan. 1925	20
Santa Gertrudis	10/4½	8/10½	10/—	July 1920	5
Selukwe (2s. 6d.)	18/6	17/7½	18/—	April 1917	6¾
S. American Copper	8/7½	8/1½	8/6	Nov. 1917	75
Tanganyika	26/3	24/4½	26/3		
Tomboy	3/6	3/6	3/6	Feb. 1925	4½

* Free of British income tax.